UNIVERSITY OF TASMANIA

Managing relationships to improve sustainability in the supply chain network for Australian food retailers

by

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STATEMENT OF CO-AUTHORSHIP

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Located in Appendix K

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Abstract

Incorporating sustainability practices into supply chain management (SCM) has attracted increasing attention from both academics and practitioners. This mainly emanated from increasing pressure imposed by various stakeholders such as government regulators, non-governmental organisations (NGOs) and customers, who expect firms to have more commitment to sustainability. This means that supply chains are actually part of extended networks that require interdependent relationship building and fostering by firms to achieve sustainability objectives. Developing effective relationships is a key factor in sustainable supply chain management (SSCM), and are crucial for firms as the valuable resources and capabilities rarely exist within one firm. Since firms interact within a large network, the focal firm maintains different types of relationship management strategies (RMS) with various supply chain network (SCN) actors, such as suppliers, manufacturers, and customers. However, finding an appropriate type of RMS relevant to sustainability practices is a challenging task. In addition, analysing SSCM from a network perspective emphasises the necessity of understanding the embeddedness of focal firms within a wider stakeholder network. Therefore, this thesis brings the topic to prominence by firstly identifying factors that conceptualise the SCN structure, secondly, categorising various types of RMS, and finally analysing the significant role of the SCN structure in deciding appropriate types of RMS when managing sustainability issues within the SCN.

Since this thesis investigates the pattern of the relationship among various SCN actors from a focal firm perspective, the main unit of analysis is a complete SCN within the Australian food retail industry. Focal firms play a key role and tend to have three unique characteristics: governing the supply chain, having direct contact to the customer and designing the product or service. Based on these three characteristics of focal firms, this thesis involves two large retailers, Wesfarmers (currently trading as Coles) and Woolworths, the two largest focal firms in the Australian food retail industry. A quantitative approach via a web-based survey was adopted to collect empirical data. A total of 278 suppliers of food products to Coles and Woolworth were

randomly selected for the survey. Sixty-six completed questionnaires were returned, equating to a response rate of 24%. The constructs developed to test the research hypotheses were validated via exploratory factor analysis (EFA) and hierarchical multiple regression analysis.

Five factors conceptualising the SCN structure (transparency, power, supplier dependency, buyer dependency, and distance) are identified and validated. In addition, four RMS (non-compliance, transactional, dictatorial, and collaborative) relevant to implementing sustainability practices are identified and validated by empirical data, which have not been thoroughly examined by prior studies. Results also suggest that distance between focal firms and their suppliers has a significant effect on non-compliance RMS; transparency, supplier dependency, buyer dependency and distance have an effect on transactional RMS; transparency and supplier dependency have an effect on dictatorial RMS; and transparency and distance have an effect on collaborative RMS. Since few prior studies have applied the network perspective in retail SCM, this thesis makes a useful contribution by empirically analysing SCM in two different complex supply chains.

As it can be challenging for focal firms to extend their efforts to numerous SCN actors in terms of sustainability issues due to the costs associated with sustainability practices, the findings of this thesis provide recommendations to managers on how to create a balance when devoting resources to managing sustainability issues between various SCN actors. In addition, suggestions are provided for managers in relation to replacing existing RMS with an alternative by controlling the related factors of the SCN structure. The findings further suggest that managers in focal firms can benefit from a network perspective by paying more attention to the peripheral SCN actors. Thus, managers in focal firms can prioritise these actors by assigning a more proactive approach (collaborative or dictatorial) to not only reduce the negative impact of public scrutiny, but also distinguish themselves in the business network by, for example, adopting green supplier championing.

LIST OF ABBREVIATIONS

AMC	Australian Maritime College
CRM	Customer Relationship Management
CSR	Corporate Social Sustainability
DCM	Demand Chain Management
DEMATEL	Decision Making Trial and Evaluation Laboratory
ECR	Efficient Consumer Response
EFA	Exploratory Factor Analysis
EMAS	Eco-Management and Audit Scheme
GSCM	Green Supply Chain Management
IMP	Industrial Marketing and Purchasing
KPI	Key Performance Indicators
MICMAC	Matrix Impacts Cross-reference Multiplication Applied to a Classification
MLM	Maritime and Logistics Management
NGO	Non-Governmental Organisations
PRQ	Primary Research Question
RMS	Relationship Management Strategies
SC	Supply Chain
SCM	Supply Chain Management
SCN	Supply Chain Network
SME	Small and Medium-sized Enterprises

SN	Supply Network
SPSS	Statistical Package for the Social Sciences
SRM	Supplier Relationship Management
SRQ	Subsidiary Research Questions
SSCM	Sustainable Supply Chain Management
SSCN	Sustainable Supply Chain Network
TBL	Triple Bottom Line
UTAS	University of Tasmania
WCED	World Commission on Environment and Development

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CHAPTER 1 INTRODUCTION

1.1 Background

In recent years, incorporating sustainable development objectives into supply chain management (SCM) context has gained wide acceptance both in the academic and practitioner worlds (Beske-Janssen, Johnson & Schaltegger 2015; Busse et al. 2017; Meinlschmidt, Schleper & Foerstl 2018; Shin et al. 2017; Tajbakhsh & Hassini 2015; Touboulic & Walker 2015; Neutzling et al. 2018). The media is replete with news about prestigious brands, such as Nike, Apple, and Tesco, being accused of sustainability violation by their suppliers ranging from social issues such as child labour and slavery, and environmental issues such as deforestation by the raw material suppliers. These sustainability incursions in a supply chain (SC) have the ability to affect a firm's behaviour, damaging reputation and threatening long-term survival (Roscoe et al. 2016). For example, Mattel in 2007 was forced to recall US$100 million worth of children's toys when one supplier used lead-contaminated paint on the firm's toys. The firm watched its stock price fall 18% in the months that followed and has since been the target of litigation (Levesque, 2012). The motivation towards managing sustainability issues has emanated from increasing pressure largely from various stakeholders such as government regulators, non-governmental organisations (NGOs), and customers who expect more commitment to the sustainability standards from firms (Hassini, Surti & Searcy 2012; Touboulic & Walker 2015). For example, consumers are increasingly demanding more environmentally friendly products/services which in turn motivate firms to adopt the sustainability standards to guarantee their long-term success (Abro, Khurshid & Aamir 2016). In addition, financial stakeholders may invest in those firms who consider sustainability issues in their decision-making process (Hassini, Surti & Searcy 2012). More importantly, governments legislate more policy and regulation related to sustainability issues that require firms to adopt this new concept in their daily business activities (Hassini, Surti & Searcy 2012) and particularly in their SCM (Meinlschmidt, Schleper & Foerstl 2018; Shin et al. 2017). In this regard, many firms have begun to redesign their process in terms of the sustainable development objectives and have adopted sustainability

standards in their SCM (Blome, Paulraj & Schuetz 2014; Shin et al. 2017; Neutzling et al. 2018; Winter & Knemeyer 2013; Yu, Solvang & Chen 2014).

The sustainability concept is often defined as "economic practices which meet the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987, p. 43). Various definitions for sustainable supply chain management (SSCM) have originated from this definition (Ahi & Searcy 2013). However, the common trait between these definitions is that they are adding social and environmental goals to traditional economic goals to analyse them simultaneously in SCM. Considering social, environmental, and economic aspects of the sustainability concept can be presented in the triple bottom line (TBL) framework which is first suggested by Elkington (1998) and then elaborated by many researchers (Santiteerakul et al. 2015). For example, the most cited definition for SSCM which is provided by Seuring and Müller (2008, p. 1700) defines SSCM as:

> The management of material, information, and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development (economic, environmental and social) into account which are derived from customer and stakeholder requirements.

Furthermore, competition in global markets has shifted from firms versus firms to SCs versus SCs (Chang, Chiang & Pai 2012; Farahani et al. 2014). The breadth of issues addressed by SCM has grown over time. For example, it began from considering suppliers and then has continued to cover all the stages that final products deliver to the end customer (Stock, Boyer & Harmon 2010; Wong et al. 2012). SCM is typically considered as a means of improving firm's competitiveness and boosting its competitive position in the marketplace (Christopher 2016). In this view, debates on incorporating sustainability into SCM have flourished in the last decade (Ahi & Searcy 2015; Mani, Gunasekaran & Delgado 2018). Thus, it seems essential to examine the sustainability concept in the firm's SCM.

The SC environment is more dynamic as it faces globalisation, technology advancement and growing customer responsiveness (Morgan 2007; Hong, Zhang &

Ding 2018). To survive in this intense competition, SC managers need to consider a variety of resources to create value for their customers (Soosay & Hyland 2015). In a sustainability context, the pressure towards incorporating sustainable development objectives into firms' businesses consistently encourages them to consider the social and environmental aspects in the extended network environment (Eskandarpour et al. 2015; Mani, Gunasekaran & Delgado 2018). The reason for this pressure is related to the difficulties for end-customers in distinguishing between the sustainability standards of the focal firms and their supply chain players (Roberts 2003). Thus, considering the importance of stakeholders' voices in maintaining a focal firm's public image, there is a strong need to report sustainability efforts to the stakeholders (Lam & Dai, 2015). Accordingly, a large number of firms have attempted to operationalise sustainable development objectives in their supply chain in a wider context (Hsu et al. 2016; Wilhelm et al. 2016a) and have started publishing their sustainability reports (Jeble et al. 2017). The annual sustainability reports from various countries can be seen for example in the research of Espinosa and Stock (2017), Koshkaki et al. (2017), and Nguyen and Stock (2017). The firms create relationships with various actors in their business environment (such as customers, suppliers and competitors as firms and universities, public organisations, local authorities, financial institutions, and governance agencies as non-firms) to pacify the increasing sustainability-related concerns of their stakeholders (Blome, Paulraj & Schuetz 2014; Klassen & Vachon 2003). Also, due to the strategic significance of managing sustainability issues as an emerging concept in SCM, it is largely agreed by various researchers such as Soosay and Hyland (2015) and Varsei et al. (2014) that the sustainable development objectives cannot be solely reached within the firms and it needs the participation of various actors in SCM (Soosay & Hyland 2015; Varsei et al. 2014).

SCM researchers have started to analyse SCs from a network perspective by arguing that the relationships between organisations involved in the firm's SC are not linear, rather, it can be considered as a pattern of direct and indirect relationship between various actors in a supply chain network (SCN) (Borgatti & Li 2009; Braziotis et al. 2013; Farahani et al. 2014; Galaskiewicz 2011; Roscoe, Cousins & Lamming 2016).

In addition, since firms have interactions and interrelations with each other and other SCN actors within a network structure (Wu et al. 2017), the network perspective provides useful insights into the application of sustainability practices to the SCN (Miemczyk et al. 2012). For example, Unilever has been questioned by NGOs such as Greenpeace about the overall legitimacy of the new sustainable supply-chain strategy when there was a lack of support from its suppliers (Peters et al. 2011). Incorporating the term 'network' into SCM also emphasises a pressing need to look at SCs as a network of relationships in which changes in one relationship can be reflected in other relationships as opposed to the linear supply chain where no changes or only insignificant changes transfer to other actors in the chain (Frostenson & Prenkert 2015). Therefore, a SCN can be considered as being a network of actors that consists of several inter-relations (Lamming et al. 2000), which makes the shift towards the network perspective "natural" (Wichmann & Kaufmann 2016, p. 740).

Every relationship is not only a path between two firms but it can also affect other relationships (Hakansson & Snehota 2002). For example, in a downstream network, a manufacturer has a direct relationship with a distributor while at the same time has an indirect connection with retailers who receive products from the distributor. This situation happens in an upstream network, as a buyer can have a direct relationship with a first-tier supplier and indirect connection with a second-tier supplier who sends materials to the first-tier supplier (Braziotis et al. 2013). Thus, "a manager's choice of certain relationships and investment decisions can influence network relationships and subsequent strategic outcomes" (Eng 2008, p. 583). Developing effective relationships is a key factor in SSCM (Beske & Seuring 2014) and is crucial for firms as the valuable resources and capabilities rarely exist within one firm (Braziotis et al. 2013). Since firms interact within a large network, the focal firm (which could be any firm in the SCN) maintains different types of relationships with various SCN actors (Chang, Chiang & Pai 2012). These relationships can help firms to implement sustainability practices effectively (Roberts 2003). However, extending sustainability practices to the suppliers in the SCN is not a simple task and can be affected by various contingency variables such as stakeholder pressure, knowledge resources, material

criticality, and transparency (Grimm et al. 2016; Wilhelm et al. 2016b). However, studies that analyse SSCM from a network perspective argue that the SC's structural characteristics can impact on the diffusion of sustainability practices throughout the SCN (Miemczyk, Johnsen & Macquet 2012). This implies that "the structure or pattern of relationships between the firm and its suppliers then influences the subsequent behaviour of each actor in the network" (Roscoe, Cousins & Lamming 2016, p. 1951). Thus, it is important to analyse how the pattern of interactions among the SCN actors can affect the focal firm's decisions to find the appropriate types of relationship management strategies (RMS).

1.2 Rationale of the research

Incorporating sustainability into SCM has been consdeired as a key component for firms to reach compettiveness and reduce the risks associated with the SCM (Rota, Reynolds & Zanasi 2013). For example, Mena, Humphries and Choi (2013, p.72) find sustainability as a "salient reason" that focal firms reach out toward different SCN actors. Focal firms may find it difficult to implement sustainability practices if they do not consider the influnce of the SCN actors (Miemczyk, Johnsen & Macquet 2012). Despite the increasing amount of research in SSCM, the way (why and how) that focal firms and their SCN actors interact in terms of sustainability practices has not been thoroughly explored (Foerstl et al. 2015; Roy et al. 2018; Dubey et al. 2017; Meinlschmidt et al. 2018). Studies in sustainability of the SCM that adopt a network perspective are still emerging (Bush et al. 2015; Crespin-Mazet & Dontenwill 2012; Harms, Hansen & Schaltegger 2013; Miemczyk, Johnsen & Macquet 2012; Roscoe, Cousins & Lamming 2016). In addition, in the SCM literature, researchers argue that the focus has been more on linear interactions between buyers and suppliers (Braziotis et al. 2013; Hearnshaw & Wilson 2013; Kim et al. 2011; Miemczyk, Johnsen & Macquet 2012). To show the dearth of research in SCN, Braziotis et al. (2013) adopt a qualitative methodology and based on secondary data (from libraries and global databases), they identify that out of 33075 publications, 6% analysed SCM from a network perspective. Similarly, a literature study by Miemczyk et al. (2012) indicates out of 73 papers which have focused on the sustainable purchasing and supply

management, 25% of them applied a network perspective and out of 37 papers which provided information on sustainability performance measures, 6% used the network level of analysis. Therefore, investigating the sustainability practices in a SCN can provide valuable insights into the SSCM literature.

To examine the implementation of sustainability practices, this research finds the Australian food industry as a suitable context. The following section and also section 4.6 discusses the main characteristics of the targeted industry and the reasons why this industry is chosen for the practical implication.

1.3 Australian food industry

The Australian food supply chain currently includes thousands of actors from various sectors of production, processors, manufacturers, and retailers ranging from highly sophisticated international companies to local sole traders to serve more than 20 million consumers (Australian Government, Department of Agriculture, Fisheries and Forestry 2012). According to the report issued by Australian Government, Department of Agriculture and Water Resources in 2018, various trends can be observed within the industry between 1988-89 and 2016-17. For example, food production increased from $65 billion to $117 billion, household food consumption expenditure increased from $49 billion to $92 billion, and net food exports increased from $16 billion to $25 billion. The key drivers in the food demand growth include population growth (55 percent of food demand growth), income growth (42 percent), and changes in tastes and preferences (9 percent) (Australian Government, Department of Agriculture, Fisheries and Forestry 2012). The Australian food supply chain is also influenced by the impact of rapid globalisation in the food production and application of different relationship management strategies implemented by major retailer groups (Australian Government, Department of Agriculture, Fisheries and Forestry 2016). Figure 1-1 demonstrates the food expenditure per person in Australia from 1988-89 to 2015-16 (Australian Government, Department of Agriculture and Water Resources 2018). Due to these significant changes, food retailers manage to improve efficiency by reducing cost and increasing scale which can lead to the more integration of the food supply chain.

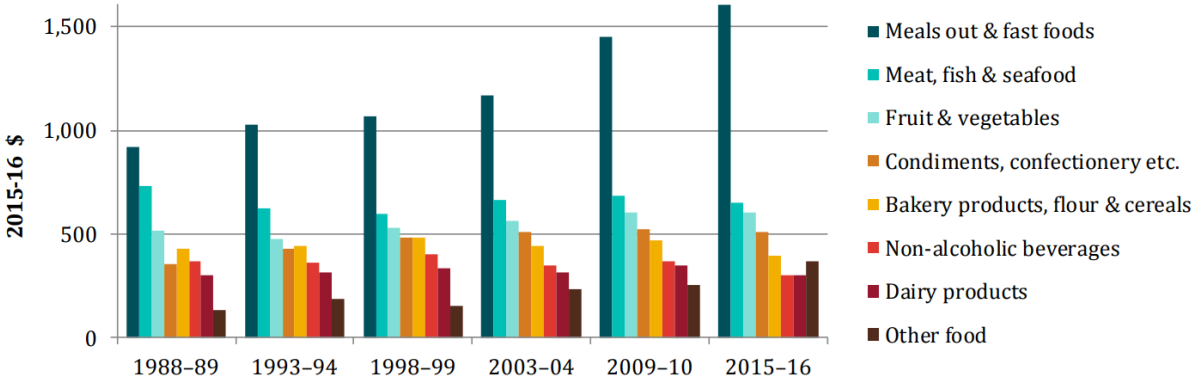

Figure 1-1. Food expenditure per person in Australia from 1988-89 to 2015-16

The Australian food supply chain consists of five main sectors; food production, food processing or packaging, food distribution, grocery retail, and food services (Figure 1-2). The first sector involves the cultivation of food derived from land and aquatic plants and animals. It also includes plant production, animal production, cereals, dairy products, and aquaculture. The second sector can be considered as the largest sector in the Australian food chain as most of the foods cannot be consumed in their raw form and they need to undergo some form of processing to be sold. The value-adding activities may include heating cooling, grinding and separating. The third sector involves the structure of a number of important product flows relevant to different product categories from the distribution centres to retailers and food services. The fourth sector encompasses places where customers can purchase their food items from either bricks and mortar stores or online shopping. The fifth sector consists of activities associated with preparing and serving food to the public such as serving customers in restaurants, take away outlets, bars, and cafes.

As previously mentioned, Australia is home to one of the most concentrated food retailers' industries around the world, in which Coles and Woolworths are the two largest players. Coles currently owns 807 supermarkets (1502 including Coles and Coles Express branded petrol stations) and has more than 112,298 employees with the revenue of $39.288 billion in Australia as of 2018 while Woolworths owns 995 supermarkets, having more than 115,00 employees with the revenue of $56.726 billion (Wikipedia 2019). Coles and Woolworths have been criticised for their anti-

competitive and duopolistic practices which provide an environment in which the competitive pressure is decreasing. However, ALDI (an international retailer) has expanded their business since day their debut store in 2001, and now have more than 500 stores across various states of Australia. According to IBISWorld's supermarket and grocery stores industry report, the market share in 2017-18 for Woolworths, Coles, and ALDI is 37.2%, 20.3% and 9.2% respectively (IBISWorld 2018). In 2008, an investigation by the Australian Competition and Consumer Commission (ACCC) in the Australian food market revealed there was growing public debate about the level of power of Coles and Woolworths in this duopoly market which can increasingly impact on the food production networks in Australia (Richards et al. 2012).

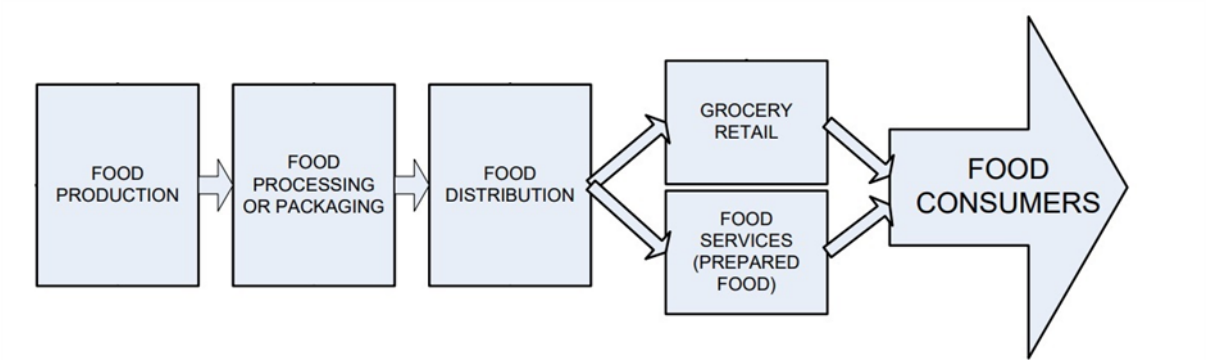

Figure 1-2. Overview of the Australian food supply chain and its dependencies

1.3.1 Coles and Woolworths

Australia's population is increasingly focused on the sustainability of their products. The government is also involved in managing sustainability in the industry by addressing specific situations such as trade practices to ensure the safety of food consumed by humans. There are also some independent organisations such as the Australian Quarantine and Inspection Service (AQIS) and Food Standards Australia New Zealand (FSANZ) that can advise companies in the industry on the implementation of government policy and legislation (Australian Government, Department of Agriculture and water resources 2018).

With the growing importance of sustainability, Coles and Woolworths have undertaken attempts to address the social and environmental impacts of their complex SCN on the people and planet. Despite addressing the way that these two giant supermarkets manage sustainability in their SCN, both retailers announce in their sustainability reports that they work with their suppliers to make sure that sustainability practices are implemented in their SCN (Devin & Richards 2018). They also participated in various sustainability programs such as collaborating with food rescue organisations to donate unsold or surplus food that highlights their corporate social responsibilities (Richards & Devin 2016).

Coles is an Australian retailer providing a variety of products such as food and beverage products, household, health, and beauty. They work with their suppliers as well as industry experts to adopt sustainability practices (Devin & Richards 2018). According to the Coles website (https://www.coles.com.au/), Coles has initiated some sustainability programs to manage their social and environmental impacts. By developing more sustainability initiatives, they focus on waste, recycling, resource efficiency, and responsible and ethical sourcing to create a positive difference in the Australian food industry. In terms of responsible sourcing, Coles is focused on animal welfare and the sourcing of raw materials. For example, in 2011, they announced that all Coles brand fresh beef includes no added hormones. In terms of product packaging, in 2014, they announced that 100 percent of their private brand water bottles have been made from recycled materials. In addition, Coles committed to the fair treatment of all workers in their SCN. In 2016, Coles was the first major Australian supermarket chain to adopt the supplier ethical data exchange (Sedex), a global ethical supply chain management platform. Coles strongly believes that by supporting their suppliers, they can grow their business alongside to provide high-quality products to their final customers. Coles also finds the importance of having long-term, collaborative, and strong relationship with their suppliers. They launched the Coles supplier charter to ensure that their suppliers understand what types of products they expect from their suppliers. In this way, they can have more transparency within their supply chain

network. According to their website, they have initiated many sustainability practices to highlight about their commitment to good faith while dealing with their suppliers.

Like Coles, Woolworths also has a systematic process to manage their suppliers via a supplier portal. They work with their suppliers effectively to (a) ‘‘ensure consumers are receiving consistently fresh and high-quality meat, fruit and vegetables every time they shop’’ (Woolworths Limited 2012, p. 3), and (b) ensure product safety (Richards & Devin 2016). According to the Woolworths’ website (https://www.woolworths.com.au/), they are focusing on working collaborately with their suppliers and developing a transparent system to manage their product flow. They ask several requirements that their potential suppliers need to meet if they want to have a relationship with Woolworths, such as having various quality and environmental certificates.

In 2007, Woolworths initiated their sustainability program by developing a sustainability strategy (named ‘doing the right thing’) in which different parts of their supply chain network such as sourcing products, packaging, transport, distribution centers, and warehouses have set targets and commitments to reduce CO_2 emissions from their facilities. For example, new fuel-efficient trucks were added to their fleet to impact on their carbon emissions. From the social aspect of sustainability, Woolworths also initiated programs to raise customers awareness by offering them variety, value, and ability to find healthier pre-packaged food. For example, in 2011, Woolworths labelled all their private brand products with the daily intake guide (DIG) to help consumers making informed decisions about buying healthy foods. In addition, Woolworths has initiated some sustainability programs for staff such as investing around $63 million into learning and development programs, establishing destinations ZERO for protecting and creating a safe zone for workers, and changing the nature of Woolworths workplace by employing more women.

1.4 Research questions

Research on finding appropriate types of sustainability practices within SCNs is scarce (Meinlschmidt et al. 2018; Grimm et al. 2016), although it plays an instrumental role

in the sustainability of a SCN (Rauer & Kaufmann 2015). Numerous sustainability practices have been identified within the literature which focal firms apply to ensure compliance with sustainability standards in the SCN (Beske & Seuring 2014). Previous studies have investigated different strategies to categorise sustainability practices, ranging from 'don't bother' in which the focal firm has only an internal focus on sustainability issues (Tachizawa & Wong 2014) to 'close collaboration' in which the focal firm directly manage SCN actors (Mena, Humphries & Choi 2013). While these studies provide information on categorising various sustainability practices into different strategies, they did not clearly investigate the application of these strategies in different situations and analyse which one is more effective than others in each situation. In addition, developing and managing sustainability practices with each SCN actor can be nearly impossible due to the cost associated with practices (Rauer and Kaufmann 2015). Considering the importance of developing appropriate relationships in SSCM, therefore, the following primary research question (PRQ) is developed to increase the understanding of effective RMS to create a sustainable SCN:

- PRQ: What relationship management strategies between focal firms and SCN actors are effective in creating a sustainable SCN?

Furthermore, recent studies have argued that implementing sustainability practices in a SCN is a challenging task due to the complexity of analysing the network structure (Wichmann & Kaufmann 2016). In particular, analysing SSCM from a network perspective indicate that the focal firms need to recognise the embeddedness of themselves within a wider stakeholder network (Dou et al. 2017; Grimm et al. 2014; Miemczyk et al. 2012; Wilhelm et al. 2016b). This emphasises that the complexity in the structure of relationships between a focal firm and its SCN actors can influence the subsequent behaviour of the firm within its SCN (Grimm et al. 2014; Meinlschmidt et al. 2018; Roscoe et al. 2016; Wilhelm et al. 2016b). This subject has been addressed as a significant point to contribute to SSCM (Parmigiani et al. 2011), which has not been thoroughly explored (Meinlschmidt et al. 2018, Wilhelm et al. 2016b). Therefore, to address the mentioned PRQ, the following subsidiary research questions (SRQ) are investigated:

- SRQ1: What types of relationships exist between the focal firm and SCN actors to incorporate the sustainability concept into a SCN?
- SRQ2: What are the factors that determine the structure of relationships between SCN actors within a SCN?
- SRQ3: How do the relationships between SCN actors affect the focal firm's relationship management strategies to achieve a sustainable SCN?

1.5 Research objectives

Overall, the main objective of this research is to examine the argument that analysing the SCN structure can provide valuable opportunities for focal firms to identify the most appropriate RMS which are needed to make their SCN more sustainable. Therefore, this research develops a network-based approach in SSCM to help focal firms achieve their sustainable development objectives. The research objectives will include:

- To explore different types of RMS implemented by focal firms to categorise sustainability practices
- To identify important factors that can conceptualise the SCN structure
- To develop a conceptual framework which analyse the impact of the SCN structure on the types of RMS to make a SCN more sustainable
- To empirically test and validate the conceptual framework in a complex SCN
- To provide insight into the successful implementation of sustainability practices in the most cost-effective manner by allocating the right practices to the right SCN actors
- To investigate how different SCN actors can have a considerable impact on the sustainability of the SCN

1.6 Organisation of the research

As an introduction, Chapter One provides the background of this research and highlights the research gap and its significance in the literature. The background suggests that to reach the sustainable development objectives in the SCN, firms need to deploy different types of RMS. In this process, the firms need to consider the impact

of the SCN structure as it can affect the firm's decision-making process to find appropriate types of RMS. In addition, the research questions and the main objectives of this research are presented.

Chapter Two discusses the basic concepts and the foundations of RMS in SCNs and explain why examining relationships from a network perspective would be more effective. It also examines various elements in the SCN structure.

Chapter Three identifies various RMS that focal firms apply to make their SCN more sustainable. In this process, this chapter presents that the SCN structure can make a significant impact on the types of these RMS. In this regard, factors that characterise the SCN structure are identified in this chapter. In addition, a conceptual framework is presented to fill the gap by linking the SCN structure and RMS.

Chapter Four outlines the research methodology and research design in details. The chapter explains how the research approach and strategy lead to the developing of a quantitative method to collect data from the Australian food and grocery industry. The unit of analysis, sampling technique, survey instruments, administration process, data analysis, and error control process are also discussed in this chapter.

Chapter Five presents the first part of the data analysis and discussion part of this research. This chapter analyses the web-based survey data and discusses the validation process of different components in the conceptual framework. Exploratory factor analysis (EFA) is conducted to discover the significant factors that conceptualise the SCN structure and types of RMS that categorise various sustainability practices. Specifically, this chapter addresses the first and second subsidiary questions of this research.

Chapter Six contains the second part of the data analysis and discussion part in which the data are analysed to find the relationships between two parts of the conceptual framework (the SCN structure and RMS). Multiple regression analysis is used to identify how the SCN structure can affect the RMS implemented by focal firms to

manage sustainability issues within SCNs. Specifically, this chapter addresses the third subsidiary question of this research.

Chapter Seven concludes the summary of the findings from the literature review and the empirical study and provides conceptual and managerial implications. The limitations of this research and the directions for future research are also discussed in this chapter.

CHAPTER 2 RELATIONSHIPS IN THE SUPPLY CHAIN NETWORK

2.1 Introduction

In today's turbulent business environment, firms are increasingly dependent on each other and are no longer expected to compete simply as an isolated business entity (Brouthers, Geisser & Rothlauf 2018; Simon et al. 2015). Improving business processes, both intra-and inter-organisational, is important which include wider cooperation and stakeholder management to achieve competitive advantage (Vom Brocke, Zelt & Schmiedel 2016). At the same time, the organisation's boundaries continue to extend as they are outsourcing the functions that are not attached to their core competencies and thus reach out to one another's resources across the SC (Lacity & Willcocks 2014; Nordigarden et al. 2014; Rhodes et al. 2016). The introduction of the concept of SCM in the early 1980s, resulted in a substantial body of knowledge in academic and commercial circles to help firms manage their businesses, from extracting raw materials to producing the final product and delivering to the end customer (Sweeney, Grant & Mangan 2015). This means competition has shifted from firms versus firms to SCs versus SCs (Simon et al. 2015).

SCs have often been considered as a series of independent organisations which are connected through dyadic ties, conceptualised as a simple linear system (Hearnshaw & Wilson 2013). Although, this linear perception of dyadic interactions is worthy of investigation, it does not represent the realities of today's complex SCs as it fails to consider the interdependence between an array of both firm and non-firm actors, including suppliers, manufacturers, NGOs and government agencies (Bush et al. 2015; Hearnshaw & Wilson 2013). This means SCM goes beyond the closest actors and considers the SC relationships from the multi-tier perspective.

A firm is part of the overall network and its business strategies depend on its embeddedness in the network structure and how it interacts with other participants (Cheng & Holmen 2015). Accordingly, in analysing the firms' business environment, they should not be considered in isolation, but as being embedded within networks

(Ritter, Wilkinson & Johnston 2004; Simon et al. 2015; Wu & Chiu 2018). Also, it is not viable for firms to own and control every step of the production process and they need to build relationships in their SCN to remain competitive in the fast-changing markets (Jin & Edmunds 2015). Lambert (2008, p. 2), for example, argues that SCM is "the management of relationships in the network of organisations, from the end customers through the original suppliers, using key cross-functional business processes to create value for customers and other stakeholders". In brief, SCM reverberates the management of business relationships across various actors in a SCN and it cannot be confined to a single firm (Grimm et al. 2015; Yeniyurt & Carnovale 2017).

To effectively implement strategies, firms need to address issues in their SCN and develop effective relationships with different SCN actors to gain required resources which are not possessed by themselves (Gold, Seuring & Beske 2010; Roberts 2003; Yeniyurt & Carnovale 2017). In this regard, five sections are provided in this chapter to discuss the various perspectives of the relationship functions in the SCN. First, the rationale for developing various types of relationships with different actors in the SCN will be provided. Then in section three, several levels of relationship management analysis are explained to show the differences between the basic concepts in SC relationship management and the more sophisticated network concept. The SCN will be introduced in section four and will be analysed by providing their structure (section five) and various types of relationships (section six) that have been used by firms to manage their SCN.

2.2 Rationale for developing relationships

The role of a relationship in today's complex business environment to acquire and create value between two or more parties is unquestionable (Pellicano, Perano & Casali 2016; Schwieterman, Goldsby & Croxton 2018). A relationship in the business context can be defined as a process of forming technical, economic and social ties among two firms or other types of organisations to achieve mutual benefits (Anderson & Narus 1991). Since businesses consist of both firm and non-firm (institutions, government regulators, NGOs) actors, this research uses the term 'organisation' to

refer to both types of actors. Firms may develop various types of relationships with different types of organisations in their SCN as their performance is either directly or indirectly influenced by them (Jammernegg & Kischka 2005; Ritter, Wilkinson & Johnston 2004). Each relationship can be considered as being significant capabilities that the firm owns since it carries various profit opportunities (Chang, Chiang & Pai 2012). Having relationships with other firms provides various benefits for firms through granting access to the valuable resources and competencies in other firms within a network (Crum, Poist & Daugherty 2011). For example, some firms may cooperate to increase their power against rivals (Ritter & Gemunden 2003), collaborate with competitors to reach the source of complementary resources (Chen et al. 2017), and jointly work on innovation initiatives (Govindan et al. 2016) such as new product development projects (Liao, Hu & Ding 2017). In addition, they may seize the opportunity of creating relationships to gain access to valuable and rare expertise to boost their competitive position by improving their performance (Maina et al. 2016). Thus, the competitiveness of the firm is connected to the ability to acquire valuable resources by creating various relationships (Pellicano, Perano & Casali 2016).

Moreover, establishing an inter-organisational relationship is one of the fast, effective and efficient ways to acquire new knowledge and achieve specialisation benefits (Hingley, Lindgreen & Grant 2015). For example, Hingley, Lindgreen and Grant (2015) emphasise the practical development in the horizontal dimension of SCM through collaborating with logistics service providers between retailers and suppliers to improve the quality standards and reduce costs in both firms. Also, through a mutual project with suppliers, such as joint research in production, a firm can understand the economic scale or scope to produce a sufficient number of products in its production line (Ebers 2001). The relationships with other business entities can create a substantial value, such as quality improvement, risk mitigation, innovation improvement, cost reduction, performance improvement and greater flexibility and scalability in both involved parties (Rhodes et al. 2016).

The ability of the firm to manage relationships with other firms can be considered as a core competency and is one of the prominent sources of competitive advantage (Blome, Paulraj & Schuetz 2014; Chang, Chiang & Pai 2012; Kumar & Reinartz 2018; Tachizawa & Wong 2014). Many of a firm's relationships with its customers and suppliers are crucial to guarantee its competitive survival and each relationship may involve a substantial amount of time and cost (Ritter, Wilkinson & Johnston 2004). A firm's decision to understand which types of relationships should be developed, maintained or discarded is of great importance to its competitive success (Alvarez, Pilbeam & Wilding 2010; Crespin-Mazet & Dontenwill 2012; Emmett & Crocker 2016; Ritter, Wilkinson & Johnston 2004). Thus, relationship management is a significant capability within a firm when creating a connection with various business entities (Perunović, Christoffersen & Mefford 2012). Walters and Adams (2001, p. 281) define relationship management as:

> The managerial activity that identifies, establishes, maintains, and reinforces economic relationships with customers, suppliers, and other actors with complementary (and supplementary) capabilities and capacities so that the objectives of the firm and all other actors may be met by agreeing and implementing mutually acceptable strategies ().

RMS have been applied in various situations, such as strategic alliances, joint ventures, partnership sourcing, and procurement (Zolkiewski & Turnbull 2002; Arnold 2017). This wide application of the relationship concept is increased for several reasons. Issues such as hyper-competitive rivalries, globalisation and the need to have access to competencies in other organisations have been motivating firms to move towards relationship management and examine how the understanding of the relationship with different actors can be connected to firms' strategies (Maina et al. 2016; Zolkiewski & Turnbull 2002).

2.3 Management level of analysis

Over the years, SCM research has shifted from a single firm towards a network of firms (Grimm et al. 2015). Currently, there is a substantial body of literature referring to the SC as being a network (Brindley 2017; Soosay & Hyland 2015). The main reason to incorporate such a wider context into SCM is due to connectedness which

supports that relationships do not exist in isolation or are independent of each other (Ritter & Gemünden 2003). Figure 2-1 depicts the evolution in the interconnectedness and complexity of SC relationships and presents a direction towards the network paradigm. Each dot indicates a SCN actor such as a supplier, customer, government body and each line represents a relationship between them (Braziotis et al. 2013). In the following sub-sections, the evolution from the dyadic perspective towards the network perspective in SCM is discussed.

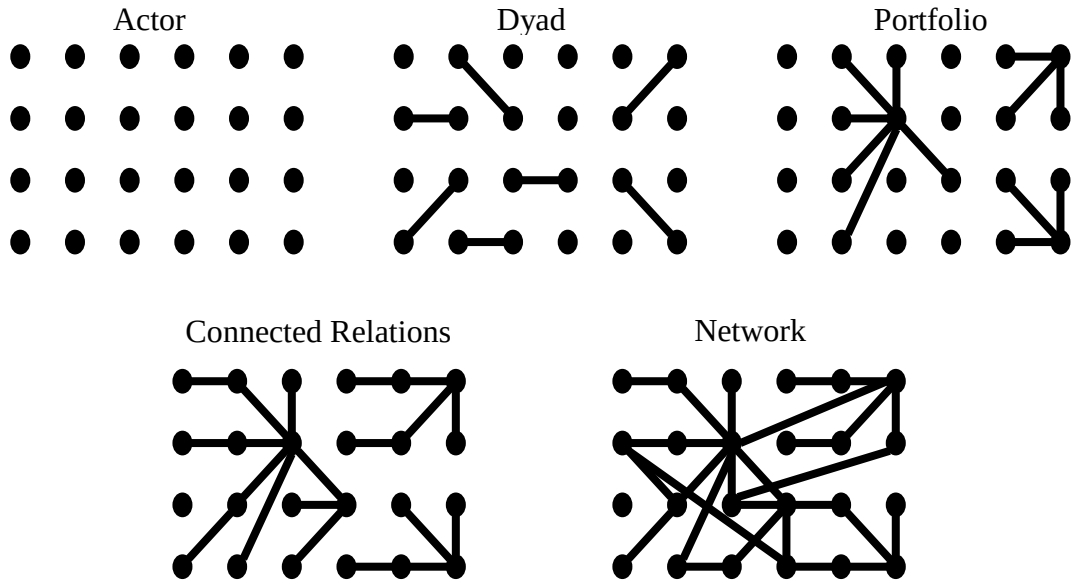

Figure 2-1. From a supply chain to a supply chain network paradigm

Source: Adapted from Ritter, Wilkinson and Johnston (2004, p. 179)

2.3.1 Dyads

The first level of analysis is the individual dyad which has been the focus of the SCM literature (Choi & Wu 2009). Dyads are concerned with relationships between only two parties (Montoya-Torres & Ortiz-Vargas 2014). Rowley (1997) argues that the focus of dyadic relationships is on the individual stakeholder's influences. This type of relationship views a firm as being the centre of its stakeholders and analyses the influences that various stakeholders (such as suppliers and customers) exert on the firm in a dyadic interaction (Huo, Flynn & Zhao 2017). For example, in the purchasing process, the typical concern is about the buyer-direct supplier relationships (Miemczyk, Johnsen & Macquet 2012), including product design, supplier evaluation,

supplier selection, and order management process (Van Weele 2018). In addition, Harland (1996) identifies that dyadic relationships related to the downstream actor, typically have focused on immediate customers' issues such as consumer behaviour analysis and customer service management.

In the 1980s, the focus of many information systems, which had evolved in SCM was about managing the fulfilment process rather than considering the demand reactions. SCM systems such as warehouse and transportation management systems were developed based on planned customer needs (Richards 2017) which emphasised the one-dimensional interaction between firms. On the customer side, the customer needs were addressed by the customer relationship management application (CRM) which was separated from the supply side (Kumar & Reinartz 2018). To show how a dyadic perspective can help firms to reach other firms' resources in SCM, Harland (1996) discusses six types of SC relationships as the main conceptualisation of dyadic relationships, vertical disintegration, supplier base reduction, focusing on operations, outsourcing, just in time and partnership sourcing. These various contexts which have been applied in different cases can show the growing importance of SC relationships in SCM.

To access resources, firms need to create relationships with other organisations. This accessibility can be achieved through various governance mechanisms such as alliances or acquisitions (Yang, Lin & Lin 2010). In a dyadic perspective, a firm typically considers characteristic differences in making decisions, such as creating a relationship with another organisation. For example, technical distances (the degree of dissimilarity in the technology infrastructure and knowledge between two firms) can affect firms' preferences in the way of accessing to the other firms' resources (Yang, Lin & Lin 2010). Jia and Lamming (2013) also suggest cultural differences as possible sources of learning issues in the buyer-supplier relationships. In this view, the unit of analysis is confined to the business environment of only two involved organisations. For example, in the one-dimensional context, Soinio, Tanskanen and Finne (2012) propose service models based on the investigation of new business opportunities that a logistics service provider offers to the small and medium-sized enterprises (SMEs).

The dyadic relationship is also used to reveal how mutual benefits are distributed in the relationship between buyer and supplier (Tanskanen 2015). However, in the dyadic relationship, firms generally are not well aware of the factors at a higher level that shape their strategic attractiveness (having the quality of influencing an actor in a relationship), which can be a major problem to leverage the relationship for gaining more benefits (Tanskanen 2015; Tanskanen & Aminoff 2015).

Mills, Schmitz and Frizelle (2004) use the upstream and downstream perspectives to address the dyadic relationships in SCM. On the upstream side, they point out two areas which have been the focus of research. The first area consists various relational practices, including the performance of the supply base (Cheng & Carrillo 2012), supplier development (Routroy & Pradhan 2014), supplier relations (Jack & Powers 2015), and supplier selection (Araújo, Alencar & Viana 2015). Many researchers also acknowledge that developing the appropriate relationships between actors of the SC is important to exploit the full potential of resources within SCM (Knoppen, Johnston & Sáenz 2015; Kumar et al. 2016; Mills, Schmitz & Frizelle 2004; Odongo et al. 2016; Tangpong et al. 2015; Xu, Huo & Sun 2014). RMS such as cooperative, trusting and long-term relationships in the buyer-supplier context are often considered as a crucial factor to improve the firm's performance continuously (Mills, Schmitz & Frizelle 2004). In particular, powerful firms like retailers find valuable benefits by seizing the opportunities from the suppliers that have a tendency to be involved in a long-term commitment and continuous improvement programmes (MacCarthy & Jayarathne 2012). The powerful firms also can use power-imbalance situations and exert more pressure on the weaker suppliers to implement various practices (Huo, Flynn & Zhao 2017; Maglaras, Bourlakis & Fotopoulos 2015), which in some cases can damage the relationship itself (Nyaga et al. 2013).

The second area is concerned about the SC operation and technical issues, including resource capacity, inventory policies, forecasting, safety stock, production planning, order replenishment, and shipment/delivery (Montoya-Torres & Ortiz-Vargas 2014). The typical example in this area is about the amplification of demand variations from one firm to another firm across the SC, which happens due to the absence of integrated

planning (Akhtari, Sowlati & Griess 2018). This phenomenon is known as the 'bullwhip effect' which is related to the SC inefficiency (Lee, Padmanabhan & Whang 1997). In addition, due to the simplicity of analysis in the one-dimensional environment (environment with two actors) (Montoya-Torres & Ortiz-Vargas 2014), a considerable number of various mathematical modelling and operations research approaches have been used in this area, including the fuzzy analytic hierarchy process (Routroy & Pradhan 2013), scenario simulation and analysis (Jahani et al. 2015), fuzzy goal programming (Asgari, Abbasi & Alimohamadlou 2016), fuzzy matrix impacts cross-reference multiplication applied to a classification (MICMAC) analysis (Kumar, Gorane & Kant 2015), and decision making trial and evaluation laboratory (DEMATEL) analysis (Routroy & Sunil Kumar 2014). These mathematical models can be difficult to implement in a dynamic environment since they are typically designed to work in a dyadic structure.

On the downstream side, the dyadic relationship is addressed by focusing on the consumption process. At the beginning of the 1990s, when some powerful US firms such as Procter & Gamble, Coca-Cola and retailers such as Wal-Mart and K-Mart established a working group and introduced the efficient consumer response (ECR) approach (Mills, Schmitz & Frizelle 2004). ECR can be defined as "working together to fulfil consumers wishes better, faster, and at less cost" (Mitchell 2001, p. 1). Since then, various approaches are addressed in this perspective, such as cycle time reduction in the distribution network, preventing duplication in logistics cost, and increasing customer services (Mills, Schmitz & Frizelle 2004). The literature on the downstream side, has more generally focused on the logistics issues, such as forecasting systems (Ali et al. 2017), customer satisfaction (Hameed et al. 2018), and the distribution networks with retailers (Igl & Kellner 2017). In addition, the issues related to the supplier selection criteria can be transferred to the criteria for selecting the best customers (Song, Xu & Liu 2017).

One form of connection in the dyadic perspective is called a portfolio relationship which is related to the situation that a firm is simultaneously engaged in some relationships (Ritter, Wilkinson & Johnston 2004). This type of relationship does not

consider the relation from both perspectives, rather very similar relationships are considered together. It can be similar in size (such as large versus small customers) or similar in their position related to the firm (such as suppliers) (Ritter & Gemünden 2003). The main issue in the portfolio relationships is about allocating limited resources of the firm to each relationship within the portfolio (Ritter, Wilkinson & Johnston 2004). Similar to the other types of dyadic relationships, the portfolio relationship seeks to solve problems in the one-dimensional environment.

Considering the significant role of both up and downstream sides in developing an effective and efficient practice in SCM, the management paradigm extends the strategic and operational issues from focusing on one side to integrate the two sides (Mills, Schmitz & Frizelle 2004). The growing awareness of the business environment by firms from being static to a more dynamic viewpoint has led firms to consider the demand sides in their SCM strategies rather than focusing on the supply process which was based on the planned customer needs (Akhtari, Sowlati & Griess 2018). Although the dyadic perspective in the SCM literature provides valuable insights about the fundamental buyer-supplier relationship and has captured the largest proportion of research in SCM (Grimm et al. 2015; Montoya-Torres & Ortiz-Vargas 2014), it has not considered the underlying SCM reality (Choi & Wu 2009). Indeed, research in a dyadic context cannot capture the complexity of the relationships between various actors in SCM (Montoya-Torres & Ortiz-Vargas 2014).

Incorporating more reality into SCM issues provides an opportunity to analyse SCM in a wider system and better understand the real and complex issues that SC managers face every day (Choi & Wu 2009; Yang, Lin & Lin 2010). Relationships are not separated from each other and are interconnected, thus the dyadic relationship turns a blind eye to the embeddedness of a firm in a wider context and is not sufficient to identify all the necessary aspects related to the interactions among firms (Choi & Wu 2009; Ritter, Wilkinson & Johnston 2004). Within a dyadic relationship, it can be analysed how an organisation influences another organisation in the two sides' interaction, however, how an interaction influences another interaction between other two organisations cannot be captured in this type of relationship (Choi & Wu 2009).

In this regard, firms need to extend their view to a wider context to create a complete understanding of their business environment.

2.3.2 Connected relations

The second level of analysis refers to the relationships that a firm has with both its upstream and downstream actors. It also includes the type of relationship that a firm indirectly develops through another firm, such as the indirect relationships between a firm and its second or more tier customers/suppliers (Anderson, Håkansson & Johanson 1994). The relationship at the connected relations level can be considered as being multiple customer-supplier relationships, starting from extracting raw material to delivering final goods (Braziotis et al. 2013). From the connected relations' perspective, the structure of the flows in SCM is viewed as a linear system in which managers usually focus on managing goods and materials that are vertically delivered between various organisations (Zuo, Kajikawa & Mori 2016). Montoya-Torres and Ortiz-Vargas (2014, p. 345) use the term "serial structure" to reflect a linear structure in SCM which consists of serial actors who play a role in delivering the final product to the end-customer (Figure 2-2). In support, Miemczyk, Johnsen and Macquet (2012, p. 483) also refer to this level of analysis as "the supply chain level" and argue that the main objective of relationships at this level is concerned with the provision of final goods where firms' involvement in various stages are examined to transform resources into these offerings.

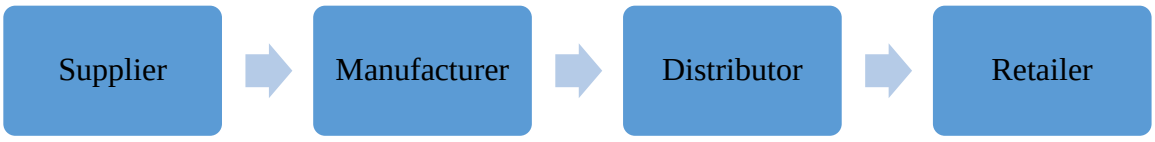

Figure 2-2. A linear supply chain

By forming relationships with the next member (or actor) of the SC, the SC members add value to maximise profit and provide efficient modes of operation (Braziotis et al. 2013). All the members need to assist each other to reach a win-win situation to improve SC competitiveness (Andrésen, Lundberg & Roxenhall 2012; Chan, Shen & Cai 2018). The key components to improve SC performance and enhance its

competitive advantages are coordination, cooperation, and collaboration (Humphries & Wilding 2004), which are the indispensable steps towards SC integration (Soosay & Hyland 2015).

Many topics have been examined with respect to the SC integration, such as product development (Elvers et al. 2016), information system design (Kauremaa & Tanskanen 2016), inventory control (Mousavi et al. 2017), corporate competitive capability (Liao, Hu & Ding 2017), and an innovative SC (Seo, Dinwoodie & Kwak 2014). Frohlich and Westbrook (2001, p. 187) use the term "arcs of integration" to present the extent to which a firm is integrated with the upstream and downstream SC members. Firms with a high level of integration with both suppliers and customers indicate considerable improvement related to financial and productivity performance (Frohlich & Westbrook 2001). Having the broad span of integration with actors beyond the first-tier actors across the linear SC demonstrates the positive impacts on the outcomes (such as SC performance) as well as customer satisfaction (Kannan & Choon-Tan 2006). Identifying which actors should be considered in the linear SC can be defined as active actors who are directly involved in the processes of providing the final products or services to the end customers (Braziotis et al. 2013). They are independent firms or business units who engage in the business process by performing operational and/or managerial activities to provide a specific outcome for a particular customer or market (Lambert & Enz 2017).

Although analysing SCM in the linear fashion provides some useful solutions for firms, they are not able to reflect the highly dynamic, nonlinear, agile and adaptive features of the SC (Mari, Lee & Memon 2015; Zuo, Kajikawa & Mori 2016). Analysing such a complexity in SCM cannot be conducted by a simple linear structure, as it fails to reach desired goals (Cheng, Chen & Chen 2014; Mari, Lee & Memon 2015). However, the main limitation of such a perspective is that the interconnections among the actors are ignored (Wilkinson & Young 2002). This interconnectedness between varieties of actors surrounding the firm can affect the firms' strategies and behaviours (Cheng & Holmen 2015). For example, the indirect relationship between government bodies and suppliers can have an impact on the firms' decision making

related to the procurement process, therefore, it needs to be taken into consideration to avoid non-compliance with the standards (Zolkiewski & Turnbull 2002). Thus, finding these indirect relationships that influence firms' critical relationships with its SC actors provides managers a strategic insight into their business environment, which is missing in the linear perspective (Zolkiewski & Turnbull 2002).

Moreover, firms have invested in many application systems, such as SC execution systems, order management, and warehouse management to coordinate the linear chain of relationships among actors (Van Weele 2018). The main tenet behind the analysis of these applications was that the flows (such as information) are sequential. For example, as firms implemented applications like electronic data exchange (EDI) and vendor managed inventory (VMI), the information was transferred between firms in a linear fashion (Richards 2017). However, this linear form of contribution may end up with misinformation and longer lead times (Sherer 2005). For example, Cisco wrote off $2.2 billion for components which were ordered in 2001. The main problem for this fiasco was the bloated demand forecast, which occurred due to the ignorance of the relationship between Cisco's customer and its competitors. Cisco's customers placed the same order from Cisco's competitors, knowing that they would just buy from whoever could deliver first. Cisco was unaware of such interactions as it saw their SCM in a linear way. Thus, by incorporating the network perspective into its SCM, Cisco increased its visibility to the entire customer and supplier network which can help them to react quickly to the market changes (Sherer 2005).

To respond effectively to exigencies, firms need to have a deep understanding of the underlying structure of their systems and how various actors are related to their systems (Hearnshaw & Wilson 2013). If firms seek to adopt to the necessary changes, they need to re-conceptualise their SCs from simple linear systems towards more complex systems (Hearnshaw & Wilson 2013; Kaneberg, Hertz & Jensen 2016; Miemczyk, Johnsen & Macquet 2012; Touboulic & Walker 2015). Hearnshaw and Wilson (2013) argue that this re-conceptualisation is important as a complex system can be modelled by numerous actors and interactions among them, not in the simple pattern of a few directed relations. In order to apply this re-conceptualisation and

neither oversimplify the SC systems, firms have attempted to incorporate the network perspective into their SCM (Choi & Wu 2009; Hearnshaw & Wilson 2013; Kim et al. 2011; Lu et al. 2013; Roscoe, Cousins & Lamming 2016; Wilhelm 2011).

2.3.3 Networks

The final level of analysis is related to the network which is the most complex level. Firms produce and deliver goods and services through a complex SC (Blackhurst et al. 2018). The intense competition in today's business environment needs firms to incessantly find the ways to reduce their operational cost, improve customer satisfaction, and minimise disruption risks through the effective and efficient management of the SCs (Bellamy & Basole 2013). By considering a SC as a complex system, firms can better analyse the function and interactions of various elements which can affect the system performance, behaviour, and characteristics (Cloutier et al. 2010). This means that a comprehensive understanding of the SCs' behaviours needs consideration of related issues in a wider context, which can be added through the network perspective in a traditional SC (Bellamy & Basole 2013).

Networks are a "living, ever-changing organism" (Ritter, Wilkinson & Johnston 2004, p. 180) and a firm's ability to manage networks can affect its performance and development (Ritter & Gemünden 2003). At the network level, analysing the SCM practices goes beyond the organisation's boundaries. It considers the multiple numbers of stakeholders, including suppliers, competitors, customers, NGOs and government bodies, and their relationships with each other (Miemczyk, Johnsen & Macquet 2012). Investigation of interrelationships between various actors within a network and analysis of their behaviours based on the positional power are not typically considered by the dyadic and linear level of analysis (Miemczyk, Johnsen & Macquet 2012). From a network perspective, the firms pay attention to the various stakeholders in their SCM rather than the firms who are directly active in the process of producing a product and it also highlights the importance of analysing the interactions between the firms and their stakeholders (Govindan, Fattahi & Keyvanshokooh 2017).

Incorporating the term, ‘network’ into SCM indicates an attempt to provide a more wider and strategic view of the concept by utilising various potential resources of network actors in a more effective manner (Jin & Edmunds 2015; Lamming et al. 2000). The network perspective questions the notion of applying the linear and the one-dimensional approach to the SC by arguing the issues of relational aspects from a distinctive fixed position in the SC (Frostenson & Prenkert 2015). For example, critical decisions such as make versus buy or acquisition really depend on the strategic position of the firms in the network (Mills, Schmitz & Frizelle 2004). Furthermore, due to the various complexity and diversity of the relations between various actors (Van Bommel 2011), the business interactions and relationships between these actors are better recognised from the network perspective (Frostenson & Prenkert 2015). This relational viewpoint emanates from the notion that resources are distributed to the various entities within the business context. To create value for the customers, firms need to interact with other firms to have access to various resources which are out of their immediate control (Frostenson & Prenkert 2015). Therefore, understanding the firms’ position and their relationship with various actors from the network perspective is a crucial step in developing appropriate types of many strategic decisions (Cheng & Holmen 2015; Mills, Schmitz & Frizelle 2004).

The most prominent tenet that is emphasised in the network is that what happens in one single interaction between the two different firms has influence on other relationships between the other actors within networks (Frostenson & Prenkert 2015). Rowley (1997) provides an example to illustrate the effects of the relationship between various actors on a firms’ dyadic relationships. In 1968, McDonnell Douglas (an aircraft manufacturer) signed a contract with Convair (supplier) to make the fuselages and cargo doors of the DC-10 aircraft. During the testing of electrical locking mechanisms issued by the manufacturer, the supplier responded that the requested mechanism was unsafe. However, the manufacturer did not consider the supplier’s warning and the report was never sent to the federal aviation administration (FAA) since there was a clause in the contract which prevented the supplier reporting to the FAA directly. Six months after achieving the FAA certification, the DC-10 crashed

due to the electrical failure in the cargo door's locking system. Analysing this case from a network perspective can show that the manufacturer fell between two actors who did not share a relationship. If the supplier and the FAA had a relationship with each other, the FAA would have received the necessary information about the failure and did not issue the certification. Moreover, if the FAA and supplier were connected, the manufacture would never have exerted such pressure on the supplier to ask for an unsafe request. This example shows that only by considering the network perspective, firms can choose appropriate behaviours with various actors within SCM.

In addition, there are a number of various changes which are happening around the world, which makes having a network perspective a necessary requirement in SCM (Morgan 2007). These changes are derived from several factors, including having better international access to sourcing and distribution systems, providing the profit opportunities due to eliminating trade barriers among nations, substantial improvement in reverse logistics systems, and the increasing intention for collaboration among firms to provide integrated solutions for customers (Morgan 2007). As the global competition among the SCs become more intense, they have to be more resilient to the effects of the new way of accessing the necessary resources. This means the SCs are considered to be a part of the extended network rather than an isolated entity as it was in the past (Kumar, Agarwal & Sharma 2016).

To have a comprehensive understanding of the SC issues, firms need to look at their SCs from a network perspective rather than the simple aggregation of customer/supplier relationships (Galaskiewicz 2011), since small changes in one part of the SC often result in a SC reaction (Cheng, Chen & Chen 2014). For example, placing orders from big firms like Walmart can be echoed throughout multiple SCs around the world. In another case, when some issues related to human rights or the environmental degradation happens with the upstream actors, downstream actors need to react as soon as possible to cover social movements in the street (Bartley 2007). Therefore, “there is growing recognition by the SC community of the significant benefits a network analytic lens can provide to understand, design, and manage SCs” (Bellamy & Basole 2013, p. 235).

2.4 Supply chain network

SCM has been concentrating on the investigation of SC relationships beyond the traditional buyer-seller dyad, focusing instead on the SCN (Bush et al. 2015). SCNs include interrelated actors involved in the process of procurement, production, and delivering the final goods or services to the end-customers (Kim et al. 2011). A SCN is a network of actors (both firms and non-firms) that consists of several connections between these actors, which seems the shift towards considering the network perspective "natural" (Wichmann & Kaufmann 2016, p. 740). The SCM literature also uses the term supply network (SN) as an alternative term for the SCN which frequently has the similar meaning in the application of the network perspective within SCM (Braziotis et al. 2013; Miemczyk, Johnsen & Macquet 2012). In addition, since there is a thin line between the concept of SCM and demand chain management (DCM), which is the process of recognising and modelling the dynamics of the visibility of customer demand (Bustinza, Parry & Vendrell-Herrero 2013), this research adopts Michael Porter's value chain concept (1985) which is well-known in distinguishing between these two concepts. Porter (1985) developed the value chain approach (Figure 2-3), and suggested the value chain is the combination of the supply chain and the demand chain which integrates the demand side (marketing, sales, and services) with the supply side (distribution, manufacturing, and purchasing). Thus, due to the unclear distinction between the SN and the SCN (Miemczyk, Johnsen & Macquet 2012) and also between SCM and DCM (Anning, Okyere & Annan 2013), from this point on, when this research uses the term 'SCN', this means the term 'SN' as well, and also it does not consider the management of the customer demand (such as demand forecasting), since this research is focusing on the supply side, and the demand side is out of this research scope.

To find the differences between a SC (shaded) and a SCN, Figure 2-4 provides a typical SC within a SCN. Each actor in the SCN belongs to at least one SC (Van Der Zee & Van Der Vorst 2005). However, there are various actors in each tier which can affect the shaded SC. "A SCN looks more like an uprooted tree than a pipeline or

chain; its branches and roots are the extensive network of customers and suppliers" (Van Der Zee & Van Der Vorst 2005, p. 67).

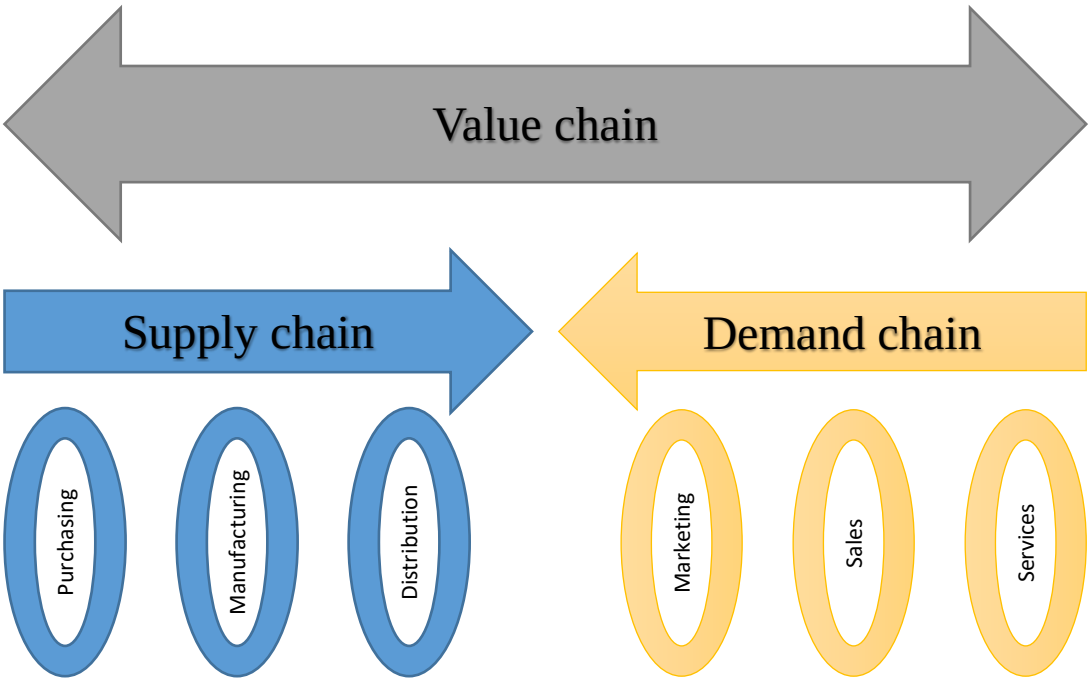

Figure 2-3. The concept of value chain

Source: Adapted from Porter (1985)

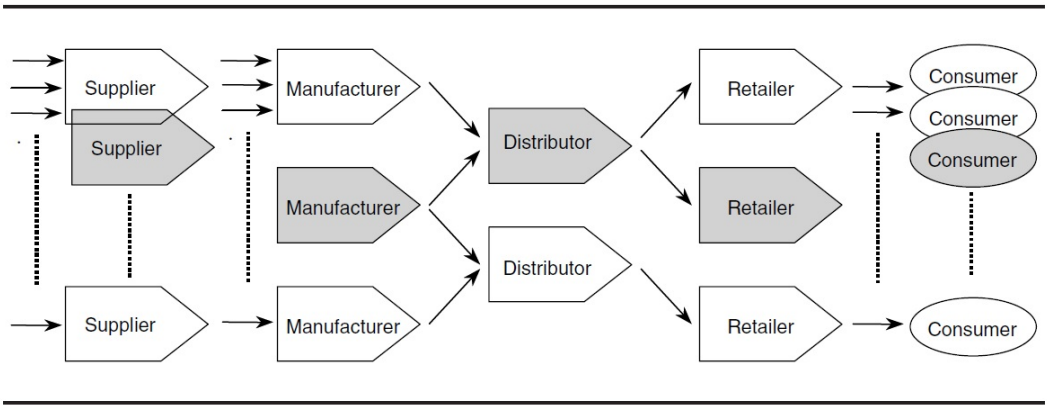

Figure 2-4. A typical supply chain within a supply chain network

Source: Adapted from Van Der Zee and Van Der Vorst (2005, p. 68)

2.4.1 Differences between supply chains and supply chain networks

Braziotis et al. (2013, p. 648) define a SC as "a set of primarily collaborative activities and relationships that link firms in the value-creation process, to provide the final

customer with the appropriate value mix of products and/or services". They also define a SCN as "a set of active actors within an organisation's SCs, as well as inactive actors to which an organisation relates, that can be called upon to actively contribute to a SC if a need arises". Based on the definitions, some of the SCN actors are active and some of them are inactive. Inactive actors are not directly involved in the process of producing final goods, but they play a significant role to enhance SC resilience, particularly during a supply crisis by providing the support resources (Braziotis et al. 2013). Furthermore, from a network perspective, the reason that a relationship varies in two distinctive dyadic relationships may originate beyond the dyadic interaction (Frostenson & Prenkert 2015; Jin & Edmunds 2015). Accordingly, investigating the interrelatedness between actors and analysing their power and influence on each other are seen as one of the significant contributions of applying the network perspective to SCM which is not included in dyadic and linear perspective (Miemczyk, Johnsen & Macquet 2012).

Another main distinction between a SCN and a SC is that, issues addressed in the SC usually refer to the operational areas as well as improving efficiency through developing better systems across the SC, including material sourcing, the product design, production, delivery, and recycling processes (Kim et al. 2011; Miemczyk, Johnsen & Macquet 2012; Morgan 2007). However, firms develop appropriate types of relationships with various SCN actors to have access to their valuable resources to implement their strategies effectively (Arnold 2017; Kim et al. 2011; Miemczyk, Johnsen & Macquet 2012).

In addition, in the case of modelling the whole SCM, traditional approaches have typically focused on the technical issues and have not paid enough attention to capture the various complexities in the structural and behavioural aspects of SCM systems (Bellamy & Basole 2013). However, firms need to examine interrelatedness and influences among SCN actors to find the appropriate strategies to meet stakeholder's expectations (Miemczyk, Johnsen & Macquet 2012). Braziotis et al. (2013) provide the main distinctions between the SCs and the SCNs (Table 2-1). They argue that SCs are typically operating in a structured way, while SCNs are more dynamic and

complex. This development is inspired by the work of the industrial marketing and purchasing (IMP) group (Ford & McDowell 1999; Håkansson & Snehota 1995; Mattsson 1997; Ritter, Wilkinson & Johnston 2004), which differentiated the notion of the network by emphasising the relationship and complexity (Braziotis et al. 2013). Thus, from this point on in this research, the term 'SCN' is used when the network perspective is applied to analyse SCM, while the term 'SC' is used when the linear perspective is applied in the analysis of SCM.

Table 2-1. Differences between supply chains and supply chain networks

Dimensions	**Supply chain**	**Supply chain network**
Focal concept	Products (and services)	Relationships
Design and configuration	Linear and ongoing, relatively stable structures (due to established power attributes)	Non-linear and dynamic structures (non-established power attributes)
Complexity	Low	High
Operations	Predictable and stable	Unpredictable/un-solidified
Coordination	Management focuses on the coordination of flow (information, products and finance) and on integration	Management focused on the coordination of the web of inter-firm relationships
Integration	Structured	Ad hoc/unplanned
Means to enhance competitiveness	Cooperation, collaboration, and coordination among SC members involving competition between these members in some occasions	Cooperation, collaboration, and coordination among members of a web of SCs. At the same time, it involves conflict and competition too

Source: Adapted from Braziotis et al. (2013, p. 649)

SCNs are not managed by an individual firm; rather it is conceptualised as self-organising systems, in which various constraints and opportunities can emerge

through local interactions occurring in the relationships among firms (Ritter, Wilkinson & Johnston 2004). This means firms have not typically enough control of all the relationships within the SCN and always try to influence others through their dyadic relationships (Tanskanen 2015). This situation indicates challenges to develop and implement RMS for firms within the network (Wilkinson & Young 2002). Thus, it is important to understand the characteristics, activities and position of all the firms and the relationships within the network structure (Håkansson & Ford 2002).

2.5 Supply chain network structure

One of the important elements of analysing the relationships in the SCN is understanding the configuration of the SCN structure (Kim et al. 2011; Singh Srai & Gregory 2008). The SCN structure indicates how various firms are configured with their linkages to each other to provide a particular value (Lambert 2008), including various types and magnitudes of relationships among actors (Winter & Knemeyer 2013). Such a deep understanding of the SCN structure is crucial for firms because the formation of linkages between different actors in the SCN can affect the implementation of the SCM practices (Liao, Hong & Rao 2010; Winter & Knemeyer 2013; Wu & Birge 2014; Zhang et al. 2018). Furthermore, within a SCN, a firm's relative position among its business actors can affect its behaviours and strategies (Borgatti & Li 2009).The network structure can be defined as the patterns of interactions among various actors (Hoang & Antoncic 2003). In SCM, this pattern can consist of various types of business activities which occur between different types of organisations (such as customers, suppliers, competitors, complementors) (Ritter, Wilkinson & Johnston 2004). The structure of SCN can be examined by referring to the horizontal and vertical dimension of the SC which various firms might employ particular relationships to achieve their objectives (Otto 2003). Some researchers present the SCN structure as a directed graph network G= (N, A), where 'N' refers to the sets of nodes, representing the SCN actors such as suppliers, manufactures, and customers, and 'A' refers to the sets of arcs, representing the connection between the actors such as purchasing interactions between buyers and suppliers (Mizgier, Jüttner & Wagner 2013; Pan & Nagi 2013). To clarify the SCN structure, a group of

researchers (Lambert, Cooper & Pagh 1998) have suggested a framework which has been frequently used by various researchers (Elgazzar et al. 2012; Lusch, Vargo & Tanniru 2010; Rajurkar & Jain 2011; Verdouw et al. 2010; Winter & Knemeyer 2013). The framework suggests three key structural aspects that the firms need to analyse in their SCN structure. These aspects are: 1) the supply chain network members; 2) the structural dimensions of the network; and 3) the various types of process links within the SC. Each aspect is discussed in the following sub-sections.

2.5.1 Supply chain network members

One challenge in analysing the SCN structure is defining network boundaries and deciding which actors should be included in the network (Rowley 1997). Therefore, it is essential to identify the related actors of the SCN. By ignoring this issue, the scope of the network may extend by adding numerous actors in each tier (Lambert, Cooper & Pagh 1998). Since networks are borderless, the key is to identify the actors who play a significant role in the value-added activities (Frostenson and Prenkert 2015).

In general, the members of a firm's SCN include all types of actors (from extracting the raw material to consuming the final product) that can directly or indirectly affect the firm's business environment (Braziotis et al. 2013). However, to make a highly complex network more manageable, Lambert, Cooper and Pagh (1998) divide members in SCM into two distinct actors; primary and supporting. Primary members refer to the independent organisations that are directly involved in the business processes of producing the specific product. Supporting members refer to the organisations that provide various sources of resources (such as knowledge, utilities, and assets) for primary members. For example, supporting members are the organisations who may lend money to the retailer (primary member), lease warehouse space to the manufacture (primary member), and provide production equipment to the supplier (primary member). The distinction between these two types of actors is not always clear. For example, an actor who provides a complex machine for a supplier's production line could be considered a supporting member, while in the case of developing a new product the supplier needs to work closely with the actor to design a new machine which makes the actor a primary member. Primary and supporting

members are identified when the firms analyse their SCM from a network perspective since the linear perspective is only able to identify the primary members.

Furthermore, the actors of the SCN can be positioned at the three levels: the upstream network level which is concerned with the interactions regarding the supply side, the focal firm level and the downstream network level which is related to the interaction on the customer side (Chang, Chiang & Pai 2012). The focal firm is a relative perspective which means that any firms could be the focal firm as they have the ability to make a strategic decision (Chang, Chiang & Pai 2012). "A focal firm represents the point of entry for the researchers, and it is the upstream and downstream trading partners of the focal firm that comprise the aggregate supply chain" (Spekman, Kamauff & Myhr 1998, p. 637). Also, it can be physically positioned at various stages of the SCM from the raw material to the end customer (Harland et al. 2001), including component suppliers (Lamming et al. 2000). Regardless of the size (such as small versus large), the focal firms may have various types of relationships with each of their supplier and customer regarding different objectives and their structural position in the SCN (Chang, Chiang & Pai 2012).

Figure 2-5 indicates the position of the actors in SCM. The SC actors shown in Figure 2-5, are the actors who are vertically connected to each other. Also, the SCN actors are the actors that exist in each layer. The SCN actors also may include non-firm actors (Bush et al. 2015; Crespin-Mazet & Dontenwill 2012). Thus, the SCN actors are both the SC actors and the actors who have a relationship with them in each layer (Lazzarini, Chaddad & Cook 2001). These types of actors can be identified based on the focal firm's knowledge and recognition of their extended network (Eng 2008). Also, the focal firm can be positioned at each level.

2.5.2 Structural dimensions of the network

Having the knowledge and understanding of the structural dimension of the SCN is necessary for analysing the SCN structure since it helps firms to model their SCN more accurately (Coviello 2018). The structural dimension of a SCN can be classified into three types; the horizontal, vertical, and horizontal position of the focal firm. The

horizontal structure is related to the count of tiers within the SCN. Having numerous tiers increases the length of a SCN. The vertical structure is concerned with the number of actors which exist in each tier. A few actors (such as customers, suppliers) in each tier can make the vertical structure narrower and vice versa. The horizontal position of the focal firm within the SCN examines where the focal firm is positioned among various tiers. Being close to the final customer or the initial supplier can be an important item in defining the SCN structure. In reality, there can be different combinations of these structural features. A firm's decision-making strategies can lead to changing the number of suppliers or customers and consequently affect the SCN structure (Fabbe-Costes & Colin 2017). For example, making decisions about changing from multiple to single source suppliers can narrow the upstream part of structure or decisions related to the collaborating with distributors rather than creating a direct relationship with the end costomer can increase the length of the downstream structure, which consequently influences the horizontal position of the focal firm in the SCN.

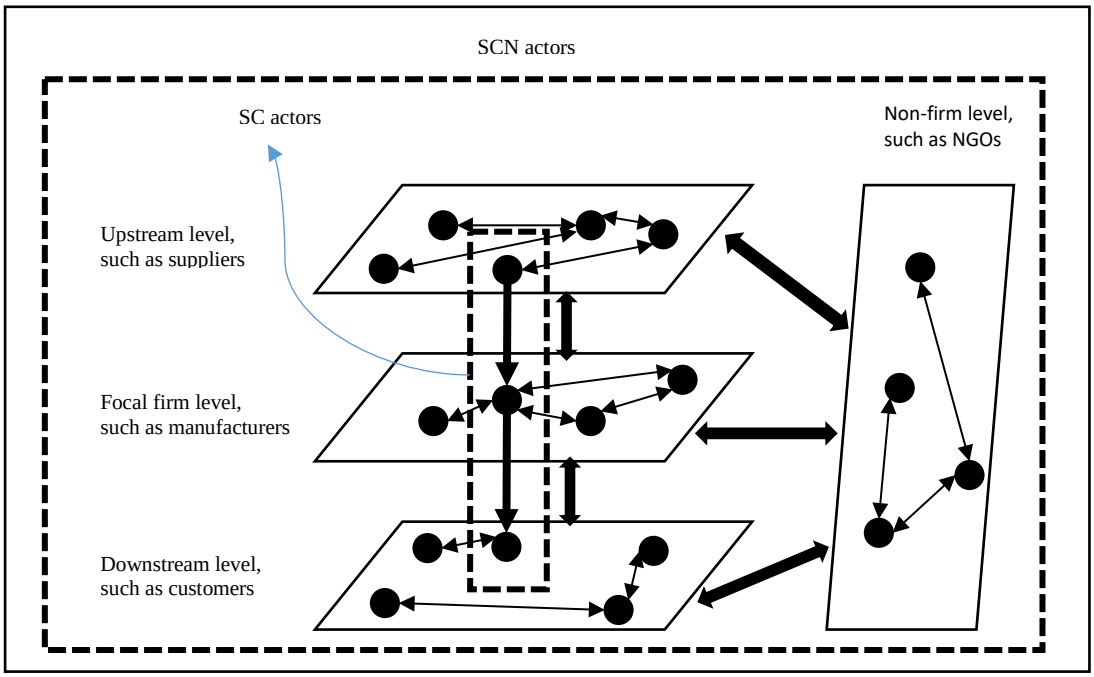

Figure 2-5. A typical SC and SCN actor

2.5.3 Types of business process links

Managing and integrating all the links which connect the SCN actors is challenging, and firms need to focus on these links which seem to be more critical than others (Lambert, Cooper & Pagh 1998). Porter (1985) argues that since the linkages among members in SCM can be seen as a source of competitive advantage, firms need to consider the strategic importance of the linkages among the SCM processes. These linkages can be fundamentally categorised into four distinctive types of SCN links (Lambert, Cooper & Pagh 1998); managed process links, monitored process links, not managed process links, and non-member business links. The managed process links are concerned with the types of links that the focal firms directly collaborate with one or more customers/suppliers. Firms usually allocate a substantial amount of resources (such as time, cost, and knowledge) in these links due to their direct involvement. These types of links can also go beyond the first-tier. The monitored process links in compared to the managed process links are not critical, but they still need to be analysed by the focal firms. Thus, the focal firms frequently monitor or audit the status of these links. The not-managed process links are the links that the focal firms are not actively involved in since these types of links do not seem important to them. In this case, the focal firms typically do not allocate resource to monitor or manage them and usually leave the full responsibility for the management of the firms who are engaged. The non-member business links are concerned with the interactions between members and non-members of the SCN. Taking this type of link into consideration is important as many case studies show that the focal firm's behaviours and strategies can be influenced by the interactions which occur in the other connected actors. For example, the focal firm's supplier may be the supplier of the chief competitor. Thus, it will be crucial to consider that link in cases of raw material availability when the focal firm has the issue of time limitation or protection of information confidentiality. Figure 2-6 illustrates a typical SCN structure in which the complexity of SCN is presented through various actors and interactions among them. It can be seen that, in reality, there are various suppliers and customers in each layer working together through different types of interactions (Figure 2-6). This pattern of interactions makes the focal

firm's SCN more complex, and they need to identify the elements of the pattern (such as actors, types of interactions) to make a right decision for their business strategies.

Firms have limited knowledge about the boundary of the network in which they are involved (Huemer 2017). This is due to the increasing invisibility of the network relationships and interactions as it expands further without limits via connected relations (Eng 2008). By accepting the arbitrary nature of the network boundary, the network analysis can be viewed in three levels; network context, network horizon, and network environment (Cantù 2017). The network context is concerned with the parts of the network that focal firms usually consider relevant and includes all the actors and linkages that can be related to the focal firms' business (Holmen & Pedersen 2003). This is similar to the combination of actors with their 'managed' and 'monitored' process links. The intermediate level is called a 'network horizon' which is related to the parts of the network that focal firms are aware of them. This is similar to the 'not managed' and 'non-member' business links and their related actors. The network environment is related to the parts of the network that the focal firms are not aware of them, therefore, where the network horizon finishes, the network environment begins (Holmen & Pedersen 2003). Firms will have different network horizons as their ability to understand and explore their business environment is different (Van Liere & Koppius 2007). A limited network horizon would prevent firms' ability to identify important trends (Ford & Redwood 2005; Huemer 2017) such as the existence of new competitors. Thus, the firms' ability to enhance and sustain their network view highly depends on their knowledge of the network relationship and the ability to interpret the relationships (Eng 2008).

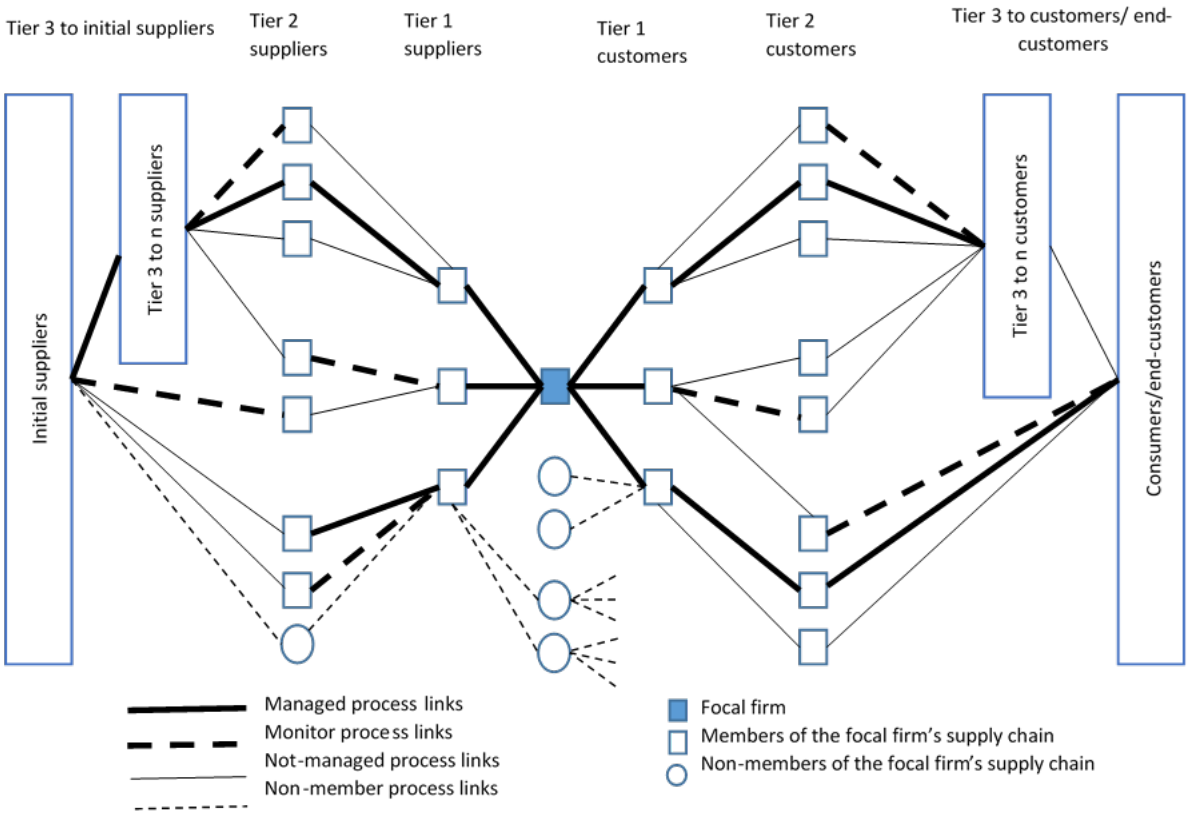

Figure 2-6. A typical supply chain network structure

Source: Adapted from Lambert, Cooper and Pagh (1998)

By determining the network boundary, the focal firms can manage and integrate their inter-organisational links further away from their immediate actors. Lambert, Cooper and Pagh (1998) provide two examples to indicate the implication of considering various links in the SCN structure. In one case, a tomato ketchup manufacturer established a relationship with the supplier of equipment and chemicals (the second-tier supplier) for its growers (first tier supplier) to provide the high quality resources for the growers as they are small to afford financially to make them by their own. This relationship management strategy ended up with high quality tomatoes for the focal firm. In another case, the focal firm established a close relationship with the second-tier supplier, after identifying that six of its first-tier suppliers purchase materials from the same second tier supplier. This new relationship is critical as any disruption in the second-tier supplier can have a tremendous effect on the firm's business environment.

Applying a network perspective to SCM provides the highest degree of complexity which demands new scanning targets, such as the new network structure (Fabbe-Costes, Roussat & Colin 2011). Choi and Hong (2002) argue that the firms can use three types of complexities to analyse their SCN structure, including vertical complexity, horizontal complexity, and spatial complexity. Vertical complexity is related to the number of tiers in the SC, horizontal complexity refers to the number of different actors in the same tier, and spatial complexity is concerned with the geographical distance of actors in the SCN. Using the network perspective can shape the structure of the SCN as a constant exchange of valuable resources among various actors which can be viewed as a complex adaptive system (Prenkert & Følgesvold 2014; Roscoe, Cousins & Lamming 2016).

A SCN is made up of nodes (actors) and ties (flows) that connect these nodes (Kim et al. 2011; Saberi et al. 2018). Accordingly, the SCN structure can be analysed based on three distinct levels: node, network, and link (Bellamy & Basole 2013). At the node level, the analysis is based on how the actors are positioned in the network (Borgatti, Everett & Johnson 2013). The actors have characteristics which distinguish them among other actors (Borgatti, Everett & Johnson 2013), such as the number of connections that one actor has with the other actors (Hanneman & Riddle 2011). At the link level, the analysis is concerned with the types of flows among actors and their strength. The flows between various actors also have characteristics such as the dollar volume of trade between two actors (Borgatti, Everett & Johnson 2013). At the network level, the analysis refers to the structure of the overall network (Kim et al. 2011). The whole network also has characteristics such as how much the network is well-connected by the number of ties among actors (Borgatti, Everett & Johnson 2013; Shankar, Bhattacharyya & Choudhary 2018). Considering these three levels collectively can assist firms to conceptualise their SCN structure.

The analysis of the SCN structure is important as it can influence the behaviour of each actor in the SCN (Roscoe, Cousins & Lamming 2016). By using the pattern of interactions among the SCN actors as a unit of analysis, firms can view themselves as a part of an interconnected network. “This, in turn, means there is a wider focus on the

relationship management" (Roscoe, Cousins & Lamming 2016, p. 1951). As a result, firms need to develop and maintain different types of relationships with the SCN actors based on each actor's position in the SCN (Byrne & Power 2014; Chang, Chiang & Pai 2012; Cheung & Rowlinson 2011).

2.6 Network relationship management

Firms are typically surrounded by various external organisations in their business environment, which makes the task of identifying effective RMS more important in terms of gaining access to the valuable resources possessed by them (Maina et al. 2016; Mao & Sun 2011; Ritter & Gemünden 2003; Ritter, Wilkinson & Johnston 2004). For example, having appropriate types of relationships with various SCN actors is critical for the efficient purchasing management and the effective incorporation of codes of conduct into the supplier network (Miemczyk, Johnsen & Macquet 2012). Gadde, Huemer and Håkansson (2003, p. 360) argue that:

> Resources always have 'hidden' and unexploited dimensions that can be explored and developed in interaction with business partners. This means that a business relationship is not only an important resource in itself, it can also be utilised to change the use and thereby the value of other resources.

This point of view encourages firms to extend their focus from a simple linear SC to the whole network while also taking the network relationships into consideration (Chang, Chiang & Pai 2012). Thus, to exploit the full potential of these valuable resources within the network, the concept of RMS needs to be incorporated into the context of network relations (Cheng & Holmen 2015; Zolkiewski & Turnbull 2002).

Various researchers emphasise the importance role of building relationships with various actors within the SCN, as it can be seen as a significant source of competitive advantage (Chang, Chiang & Pai 2012; Cheng & Holmen 2015; Eng 2008; Roscoe, Cousins & Lamming 2016; Westerlund & Svahn 2008). For example, recent studies show that SMEs are highly dependent on the various actors within the SCN for their business development (Lin & Lin 2015; Maina et al. 2016). At the same time, building and maintaining relationships (such as partnerships) with each actor can be costly and

risky (Chkanikova 2012; Rauer & Kaufmann 2015). For example, close relationships are not always an appropriate type of relationship (Daugherty 2011). In support, Roscoe, Cousins and Lamming (2016) argue that to develop eco-innovation in the SCN, firms need to create strong ties with strategic suppliers, create weak ties with multiple small suppliers, and create weak ties with suppliers that bridge the structural holes (the structural hole happens when there is no relationship between two actors (Burt 2004)). This means that to manage the material, information, and financial flows across the SCN, firms need to develop different types of RMS (Prenkert & Følgesvold 2014) since treating the same approach with each SCN actor may not be effective. For example, Crum, Poist and Daugherty (2011) identify that firms do not need to create a close relationship with all the suppliers.

Since the RMS are highly dependent on the network structure, firms confront different types of network relationships (Berry 2017). Lin and Lin (2015, p. 1782) use the term "network content" to conceptualise the network structure. They divide network content into the network breadth and the network depth. Having a high level of networking breadth happens when firms have numerous relationships with actors in their network structure. Having a high level of networking depth occurs when firms have fewer relationships with actors and also have a high concentration of them. They also identify four different types of network relationships for firms including short-term (short-term contract) and team type (various participation) which are used when the breadth of networking is high, and project (task orientation) and long-term type (long-term contract) which are used when the depth of networking is high. Each relationship needs different levels of investment and generates different outcomes (Daugherty 2011). Golicic and Mentzer (2006) refer to this as the relationship magnitude which can be identified by the degree of the relationship strength and closeness between two actors in the network. This means that based on each specific condition, firms need to develop particular types of relationships. Thus, a firm's choice of types of relationships can affect strategic outcomes (Eng 2008).

Finding an appropriate type of relationship in the SCN is important for firms, as it affects the types of activities which need to be undertaken by the firms (Veludo,

Macbeth & Purchase 2006). For example, it can influence the level of information sharing between two firms (Roscoe, Cousins & Lamming 2016; Veludo, Macbeth & Purchase 2006). Also, by considering business relationships as a channel to influence other actors, firms can determine and exert the level of influence on the various SCN actors (Prenkert & Følgesvold 2014). These exchange relations can occur between the focal firm and various types of stakeholders within the network, including suppliers, manufacturers, distributors, customers, and government bodies (Wilkinson & Young 2002). For example, they can be categorised into three types of relationships; customer relationships, supplier relationships, and indirect relationships (such as suppliers' supplier, competitors, and government bodies) (Zolkiewski & Turnbull 2002). Thus, to develop the effective RMS with these actors, the focal firms may need to identify the relationships between and within these three groups' portfolios (Zolkiewski & Turnbull 2002).

From a stakeholder pressure perspective, Rowley (1997) examines firms' responses based on the network structure and proposes four types of relationships for the focal firm. He argues that in a highly dense network (where there are many effective interactions among actors within the network structure) and with the high centrality of the focal firm (where the focal firm is powerful and can influence the formation of expectation among actors), the focal firm will apply a compromiser role which will try to negotiate with its stakeholder. In the case of the low density and the high centrality, the focal firm will apply a commander role which will try to control stakeholder behaviours and expectations. In the situation where the density is high, but the centrality is low, the focal firm will adopt a subordinate role which will try to comply with the stakeholder expectations. Finally, when both the density and the centrality are low, the focal firm will apply a solitarian role which will try to avoid stakeholder pressures. This kind of typology can help firms to better understand the causes of the competitive pressures and assists them in implementing the various appropriate strategies to face these pressures. For example, if customers demand more quality standard from the SCN actors, the focal firms need to create a strong relationship with the actors to achieve the quality level (Prenkert & Følgesvold 2014).

Some researchers use the term ‘network governance’ to indicate the mechanisms that firms employ to govern the relationships among various actors (Arnold 2017; Hoang & Antoncic 2003; Pilbeam, Alvarez & Wilson 2012), which similarly convey the message that RMS provide in the SCM literature. For example, Gimenez and Tachizawa (2012) divide the SCN governance mechanisms into two approaches. The ‘hands-on’ approach which refers to the types of SCM practices that focal firms directly involve in implementing them. The ‘hands-off’ approach is concerned with the types of practices that focal firms indirectly engage by, for example, using the related standards to manage them. The SCN governance mechanism can also be divided into formal and informal governance mechanism, incorporating into the relationships to provide the level of clarity (such the responsibility for each actor involving in a relationship) for all SCN actors (Alvarez, Pilbeam & Wilding 2010). This stream of research can be found in various works (Plambeck 2012). Table 2-2 summarise various types of RMS which have been applied in SCM.

By understanding and analysing network characteristics, firms can better implement their strategies to achieve a specific objective. From the network view, one of the important issues for both managers and researchers is to understand the network’s function so that firms can better examine why SCNs create particular outcomes (Zokaee et al. 2017). Managers typically integrate different business process links for different objectives. This means that firms can use the network relationships and interactions to achieve a specific outcome (Lu et al. 2018). Firms also can use particular types of relationships to commercialise various types of innovations (Partanen, Chetty & Rajala 2014). As choosing certain types of relationships can affect the strategic outcomes and also each relationship can influence the activities undertaken by the focal firms, it is necessary to clarify the certain context to specify which business process activities need to be emphasised and analysed. As discussed in Chapter One, sustainable development is the main pressure from stakeholders to push firms to adopt sustainability practices in their SCM to produce sustainable outcomes in their business. The next chapter explains the sustainability concept in

SCM based on the network perspective and discuss how the SCN structure can affect the types of RMS which firms apply to implement sustainable business practices.

Table 2-2. Various types of RMS in SCM

Types of RMS	**Sources**
• Strong ties with strategic suppliers • Weak ties with multiple small suppliers • Weak ties with suppliers that bridge the structural holes	(Roscoe, Cousins & Lamming 2016)
• Short-term network relationship • Team type network relationship • Project type network relationship • Long-term network relationship	(Lin & Lin 2015)
• No relationship • Followship relationship • Leadership relationship • Mutual relationship	(Ritter, Wilkinson & Johnston 2004)
• Type 1: low volume operational information • Type 2: high volume operational information • Type 3: low volume strategic information • Type 4: high volume strategic information	(Samaddar, Nargundkar & Daley 2006)
• Customer relationships • Supplier relationships • Indirect relationships	(Zolkiewski & Turnbull 2002)
• Compromiser role • Commander role • Subordinate role • Solitarian role	(Rowley 1997)
• Hands-on approach • Hands-off approach	(Gimenez & Tachizawa 2012)
• Hands-on approach • Hands-off approach	(Nisbet 2018)

In sum, “no organisation is self-sufficient” (Touboulic, Chicksand & Walker 2014, p. 581), and therefore firms need to create relationships with various organisations to have access to valuable resources. Having these resources is crucial as they can affect a firm’s SCM performance. Since demand and supply interactions are not confined to dyadic relationships (Rowley 1997), it seems essential to examine the impact of other relationships on the firm‘s dyadic relationships. This highlights the important role of a network perspective in SCM. However, developing relationships with various SCN actors may turn out to be costly and may not generate the intended outcomes (Daugherty 2011). In this regard, firms need to develop different types of RMS to

maximise their utilisation of the resources of SCN actors (Kähkönen 2014). In deciding which types of RMS with various SCN actors are appropriate, a firm needs to consider the structure of its SCN. “If a supply chain is viewed as a network of relationships, the structure and configuration of these relationships become an important consideration” (Grimm et al. 2015, p. 415). This implies that the structure or the pattern of interactions between a firm and its SCN actors (stakeholders) can affect the subsequent behaviour of the firm in its SCN (Roscoe, Cousins & Lamming 2016). Thus, it seems important to identify the stakeholders’ expectations and analyse how they can be addressed through creating RMS within the SCN.

2.7 Summary

This chapter explained the various issues related to relationship management in the supply chain network. At first, the rationale and necessity for developing the relationships with the other organisations were discussed. Then the trends from the typical dyadic relationships towards creating the relationships within the network structure were demonstrated. In this regard, the supply chain network structure was scrutinised by examining the supply chain network member, structural position and various types of business links which exist among the actors. Finally, to govern the whole supply chain network, this chapter presented some fundamental network relationship management models, which help firms to manage their supply chain networks. The next chapter will analyse sustainability in SCNs and explore how the previous works deal with this context and after identifying the main gap, the proposed conceptual framework will be illustrated.

CHAPTER 3 SUSTAINABLE SUPPLY CHAIN NETWORKS

3.1 Introduction

In recent years, incorporating sustainable development objectives into SCM has become an important topic among numerous researchers (Ahmad, Brito & Tavasszy 2016; Busse et al. 2017; Meinlschmidt, Schleper & Foerstl 2018; Tajbakhsh & Hassini 2015; Touboulic & Walker 2015). The driving force for the interest is the mounting pressure from various stakeholders such as government regulators, community activists, and customers who expect more commitment to sustainability issues from firms (Abbasi 2017; Eskandarpour et al. 2015). These commitments include the social issues, such as the provision of safe working conditions and the payment of a living wage to their employees (Meinlschmidt, Schleper & Foerstl 2018), and the environmental issues, such as preservation of natural resources, waste minimisation, and reduced emissions (Crespin-Mazet & Dontenwill 2012). The reason for this pressure may be related to the difficulties for end-customers to distinguish between the sustainability standards of the focal firms and their supply chain players (Roberts 2003). In this regard, many firms have been redesigning their processes in terms of sustainable development objectives and employing various sustainability practices to enhance their brand and increase their competitive advantage (Blome, Paulraj & Schuetz 2014; Dubey, Gunasekaran & Papadopoulos 2017; Winter & Knemeyer 2013; Yu, Solvang & Chen 2014).

As mentioned in Chapter Two, the relationships between actors across the SC are not linear, rather, they can be understood as a web of direct and indirect relationships between various actors in a SCN (Frostenson & Prenkert 2015; Hearnshaw & Wilson 2013; Miemczyk, Johnsen & Macquet 2012; Roscoe, Cousins & Lamming 2016). Managing sustainability issues within SCM includes a set of standards and practices that use a SC as a channel to influence the social and environmental status of the manufacturing and consumption process. The network perspective, therefore, provides information to better understand the sustainable development objectives beyond a firm's boundaries (Kaneberg, Hertz & Jensen 2016; Miemczyk, Johnsen & Macquet

2012; Touboulic & Walker 2015), and has been considered as a high interest area by numerous researchers (Frostenson & Prenkert 2015; Meinlschmidt, Schleper & Foerstl 2018; Roscoe, Cousins & Lamming 2016; Wilhelm et al. 2016b).

In response to the increasing pressure from various stakeholders, a growing number of large firms have attempted to employ various sustainability practices within their SCN (Dubey et al. 2017; Plambeck 2012; Tachizawa & Wong 2014; Wilhelm et al. 2016a). Due to the vast resources these firms have, researchers often refer to them as focal firms in the business sustainability which may be necessary to institutionalise the sustainability agenda in the SCN (Glover et al. 2014). However, finding appropriate types of sustainability practices, which relate to different types of business relationships, is a challenging task (Grimm, Hofstetter & Sarkis 2016; Meinlschmidt, Schleper and Foerstl 2018). Typically, focal firms are embedded in an extended network environment, which consists of various SCN actors (such as suppliers, manufacturers, customers) who are often interrelated. The power balance, for example, between suppliers and retailers can affect the quality of the relationships between them (Mysen, Svensson & Högevold 2012). Accordingly, the position of the actors and the pattern of interactions among them within the SCN structure can affect the implementation of the sustainability practices implemented by the focal firms (Fabbe-Costes, Roussat & Colin 2011; Meinlschmidt, Schleper & Foerstl 2018; Touboulic & Walker 2015).

Many studies have identified the significant impact of the SCN structure on a firm's strategic actions with respect to incorporating sustainability practices into its SCN (Frostenson & Prenkert 2015; Meinlschmidt, Schleper & Foerstl 2018; Roscoe, Cousins & Lamming 2016; Tachizawa & Wong 2014; Wilhelm et al. 2016b). However, there is still a strong need to explore different aspects of SCN structure within SSCM (Meinlschmidt, Schleper & Foerstl 2018; Wilhelm et al. 2016b). Therefore, the impact of the SCN structure on the adoption of sustainability practices and consequently the types of relationships applied by the focal firms, this Chapter starts with explaining the sustainable development objectives. The significant role of SCM in the focal firms' sustainable development objectives is then discussed. By

providing the network perspective, section four describes how the focal firms can improve sustainability in their SCN. This section also provides various RMS for implementing the sustainability practices and then section five highlights the role of the SCN structure as a key factor to customise the approaches employed by the focal firms. In the last section, a conceptual framework is developed which helps the focal firms understand how they can choose appropriate types of RMS to make their SCN more sustainable.

3.2 Sustainable development objectives

The concept of sustainable development is considered by many scientists as the main solution of stability in mankind's development, facing contemporary challenges and crises (Golub 2015). Given the wide attention that has been devoted to the topic of sustainable development globally, the world has now embraced this quite recent phenomenon (Ansari & Kant 2017). However, some firms still have some doubts about the importance of the concept (Hassini, Surti & Searcy 2012). Thus, it is important to highlight why moving towards the sustainable development objectives can help firms in conducting their businesses.

3.2.1 Reasons to develop the sustainable development objectives

'Sustainable development' and 'sustainability' are terms that are used interchangeably (Ramirez 2012). These concepts originated from the report published by the World Commission on Environment and Development in the report '*Our Common Future*', which defines sustainable development as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987, p. 43). This definition, which still represents the most quoted of all the definitions of sustainable development (Brandon 2012), highlights that humans are dependent on the environment in a much wider sense than just the resource exploitations (Hopwood, Mellor & O'Brien 2005). The main reason for developing this concept is related to the consideration of a threatened future as there are high risks of the irreparable side effects of ignoring the sustainability concept (Santiteerakul et al. 2015). This reason can be analysed at two levels; micro-level and macro-level.

At the macro-level, human society is challenged by many serious issues. These include fast degradation of the world's natural resources, climate change, exceeding consumption of products, increasing usage of toxic waste and chemicals, and the substantial imbalance between the demand and the supply of material resources (Virakul 2015). These trends may have various reasons such as the population growth, the technology development, and improvement in people's living standards (Santiteerakul et al. 2015). For example, in the case of water scarcity, Vörösmarty et al. (2000) report that much of the world's population growth will occur in the urban area (almost 5 billion from 1995 to 2025), which can challenge human life in relation to water pollution and associated disease. Due to the fundamental changes in the water supply and the demand, the water infrastructure is becoming much more vulnerable (Vörösmarty et al. 2000). Also, the increasing pace of development in technology also has a great impact on the accelerating use of resources, such as the massive use of hazardous artificial chemicals and disposing of toxic materials which can, for example, produce greenhouse gas and deplete atmospheric ozone (Santiteerakul et al. 2015). Furthermore, increasing the standard of living can lead to the increasing consumption of various resources such, water, energy, and food which consequently can endanger the availability of resources for the future generation (Santiteerakul et al. 2015). "If current challenges are not addressed in time, the well-being of human civilization may be severely endangered" (Virakul 2015, p. 431). Thus, it is important to consider these changes.

At the micro-level, the business sector plays a key role in addressing sustainability issues, since it has sufficient capabilities to adopt the sustainable development objectives (Virakul 2015). Firms can incorporate the sustainable development objectives into their strategies, which potentially become a source of competitive advantage (Addo-Tenkorang et al. 2017). Hopkins (2009) suggests eight reasons which motivate firms to incorporate sustainability into their business environment. First, 'planning' is changing, since the management attitude towards sustainability has changed being pushed by widely varied sources, such as NGOs, government regulators, and the public. Second, increasing 'productivity' can be cited as a benefit

of adopting sustainability which can come from energy saving and resource efficiencies. Third, improving 'reputation' is the outcome of committing sustainability initiatives which can lead to better serving of customers. Fourth, 'strategy' is now better formulated by undertaking sustainability issues in the business environment. Fifth, addressing sustainability issues usually leads to the 'innovation', which can open an unexpected opportunity in the marketplace. Sixth, developing better 'coordination' among business partners can be achieved via sustainability initiatives since solving sustainability problems compels collaboration across all boundaries. Seventh, creating 'trust' can be the result of closing mutual sustainability projects among firms. Eighth, the concept of first-mover 'advantage' can be the reward for firms, which initiate sustainability practices in their business environment. Thus, it seems essential for firms to look at the sustainability concept more seriously than before.

There are varieties of titles for business sustainability initiatives such as corporate social sustainability (CSR) (Epstein 2018). Business sustainability and CSR are similar as they typically tend to be used as synonyms and also share a number of key features (Ahi & Searcy 2013). However, based on the well-known definition of sustainability by WCED in 1987, the definition of sustainability covers not only the economic dimension of firms' business environment but also the preservation of natural resources and sustainment of societies that the firms serve (Winter & Knemeyer 2013). This fundamental approach was the starting point in interpreting various implications of sustainability in business.

3.2.2 Triple bottom line sustainability perspective

Understanding sustainable development objectives helps to operationalise sustainability in business, including the three dimensions of social, environmental and economic development (Barkemeyer et al. 2014), which was originally proposed by Elkington (1997). The concept of TBL was introduced in the mid-1990s, where the firms' sustainable performance systems were designed based on the three mentioned dimensions (Winter & Knemeyer 2013). The philosophical foundation of sustainability stems from the paradigm of environmental management, whereby the

growth in the economic criteria can be achieved by the simultaneous improvement in the social conditions and preservation of the environmental resources (Barkemeyer et al. 2014).

Some researchers apply a diverse nomenclature, such as the 3E's (equity, environment, and economics) and the 3P's (people, planet, and profit) to cover the similar point of view to that of TBL (Winter & Knemeyer 2013). Advocates of these views argue that by considering the TBL the firms can create more value in the long-term in comparison with the firms that focused only on financial issues. While the 'traditional' economic dimension of sustainability is extensively employed in the various business contexts and its criteria are well accepted by the firms, the 'new' social and environmental dimensions are less widespread as there are more difficulties in measuring their relevant criteria (Winter & Knemeyer 2013).

Due to the pressure from various internal stakeholders such as the employees and shareholders and also the external stakeholders such as legislators and consumers, a large number of firms have attempted to incorporate sustainability into their businesses (Beske & Seuring 2014; Sweeney, Grant & Mangan 2015; Tajbakhsh & Hassini 2015; Touboulic & Walker 2015; Varsei et al. 2014). This does not mean that the economic dimension is affected adversely by the other two dimensions (Winter & Knemeyer 2013). In other words, firms consider these three dimensions simultaneously to achieve long-term economic benefits and competitive advantage (Carter & Rogers 2008; Dubey et al. 2017).

Finding tangible metrics for the three dimensions to operationalise the concept of sustainability is not simple and is not compatible with the traditional performance systems (Touboulic & Walker 2015). The 'social dimension' of sustainability is concerned with the human capital of the firm's business environment. Improving sustainability in this dimension can occur through developing the effective practices that are appropriate to the employee, communities, and regions affected by the firms' business environment (Sloan 2010). This dimension of sustainability is seen as the most challenging one and is difficult to interpret (Hall & Matos 2010). The

‘environmental dimension’ of sustainability relates to the natural environment, such as water, land, plants, and air. To improve sustainability in this dimension, firms need to develop practices to reduce the ecological footprint of their business environment (Sloan 2010). Among the three dimensions, the environmental dimension has gained the large proportion of work in the literature (Winter & Knemeyer 2013). The ‘economic dimension’ of sustainability refers to the well-being and long-term viability of the firms with respect to the financial resources. The economic dimension can be typically quantified and achieved by various practices to reach competitiveness, such as increasing market share and improving financial health (Sloan 2010). A list of indicators for each dimension can be found in the global reporting initiative (GRI) (GRI 2006). Achieving sustainability goals through only one of its different dimensions is not possible (Dubey et al. 2017). Thus, researchers have recommended a simultaneous consideration of all three dimensions of sustainability in business (Gupta, Lee & Rudd 2014).

Incorporating these three dimensions into the business environment, requires firms to go beyond their internal environment and involve various stakeholders to make the process of sustainable development more effective (Touboulic & Walker 2015; Varsei et al. 2014). The firms have recognised that developing sustainability strategies is based on the extension of the traditional internal process beyond the firm’s boundary to their SCM (Rauter, Jonker & Baumgartner 2017), since SCM can be considered as a point to focus on stakeholders’ expectations in terms of business sustainability (Ahi & Searcy 2013, 2015; Gimenez & Tachizawa 2012). “SCM shares the stakeholder focus with the concept of business sustainability” (Ahi & Searcy 2013, p. 330). As a result, researchers have started to examine the incorporation of the sustainability concept into SCM. They encourage firms to strategically initiate the sustainability programs in their SCM to achieve higher performance in the economic criteria and also create new ways of competitive advantage (Dubey et al. 2017; Fabbe-Costes, Roussat & Colin 2011). In this regard, many firms have begun to redesign their SC process in terms of sustainability objectives and employ various sustainability

practices to enhance the brand and increase competitive advantage (Blome, Paulraj & Schuetz 2014; Winter & Knemeyer 2013; Yu, Solvang & Chen 2014)

3.3 Sustainability in supply chain management

There have been many changes to SCM within the last few decades and firms are still trying to recognise and streamline their SCs to be effective in facing the strategic challenges (Fabbe-Costes, Roussat & Colin 2011). Considering the importance of incorporating the sustainable development objectives into SCM, many experts are convinced that "all industries will be challenged to reorganise their supply chains" (Vachon & Mao 2008, p. 1552). This means that the sustainability issues must be integrated into the various processes of producing a product, including the product design, sourcing the raw materials, the product use and product end-of-life (Linton, Klassen & Jayaraman 2007). Thus, SSCM is recognised as a strategic issue for the firms to reach competitiveness (Dubey et al. 2017).

3.3.1 Defining SSCM

There are a variety of definitions related to SSCM. Ahi and Searcy (2013) in their extensive literature review, identify twelve unique definitions of SSCM. Although the definitions highlighted the incorporation of the three dimensions of TBL, none of them considers each dimension in their relative context directly. For example, Jorgensen and Knudsen (2006) only mention the social dimension of sustainability, whilst Wittstruck and Teuteberg (2012) emphasise the concept of ethics in the social dimension and provide a definition based on the combination of ethical and environmental aspects of sustainability in the SC. Instead of just focusing on the ethical component of the social dimension, Seuring (2008), Badurdeen et al. (2009), and Haake and Seuring (2009) suggest the overall combination of the social and environmental dimension of sustainability. Closs, Speier and Meacham (2011) consider mixing the environmental and the economic feature of sustainability. In addition, according to Ahi and Searcy (2013, p. 308), the most cited definition of sustainability is:

> The management of material, information and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, economic, environmental and social, into account which are derived from customer and stakeholder requirements (Seuring & Müller 2008, p. 1700).

In this definition, there is a tendency to add three dimensions of sustainability alongside the conventional SCM (Alexander, Walker & Naim 2014). Recent definitions of SSCM show that the incorporation of sustainable development objectives into the SCM, has shifted from focusing on single or the combination of two aspects towards an incorporation of all three aspects of sustainability. Thus, this can be considered as a sign of reaching some consensus towards defining SSCM.

Another significant point about the above definition is the notion of external stakeholder pressure and the impact of this aspect on the firm's endeavour towards making their SCM sustainable (Touboulic & Walker 2015). The media is replete with news about prestigious brands, such as Nike, Apple, and Tesco, being accused of sustainability violation in their SCN ranging from the social issues such as child labour and slavery and the environmental issues such as deforestation in the raw material suppliers (Roscoe, Cousins & Lamming 2016). These sustainability incursions have the ability to affect a firm's behaviour, damaging reputation and threatening long-term survival. For example, Mattel in 2007 was forced to recall US$100 million worth of children's toys when one supplier used lead-contaminated paint on the firm's toys. The firm watched its stock price fall 18% in the months that followed and has since been the target of litigation (Levesque 2012). In addition, the development of the new standards related to the social dimension (such as Utz Kapeh and Fair Trade) and the environmental dimension (such as Organic and Rainforest Alliances) is essentially urging firms to move towards incorporating sustainability into their SCM (Dubey et al. 2017). Government regulations and consumer awareness are the main reasons that encourage firms to consider the social and environmental dimension of sustainability in the extended network environment (Eskandarpour et al. 2015; Patel & Desai 2018).

Another interesting point about the definitions of SSCM is that the coordination and the flow (such as information, material, and financial) are the most common characteristics (Ahi & Searcy 2013). For example, from the operational viewpoint, the collaboration between various actors in SSCM is an underlying factor in suggesting the integration of the internal and external business process (Ahi & Searcy 2013). Some researchers also argue that creating the highly collaborative ways of interaction between all participants in the SC can be the solution towards a sustainable competitive advantage and reduce the SCM risks (Revilla & Saenz 2017). Thus, considering the SC as a complex system with collaboration between various stakeholders (such as consumers, multiple firms, and the government) may address the sustainable development issues (Eskandarpour et al. 2015). In other words, an individual firm has not enough power to manage all the complex issues of sustainability and it must collaborate with the network of actors where it is embedded (O'Callaghan & Murray 2017). Thus, it seems difficult for a firm to expect an effective application of sustainability when other actors in the firm's SCN have not made significant steps towards managing sustainability issues (Crespin-Mazet & Dontenwill 2012).

Furthermore, managing sustainability within SCM includes a set of standards and practices that use the SC as a channel to influence the social and environmental status of the manufacturing and consumption process. However, this attitude is not covered by the dyadic relationship or inter-firm coordination as the linear perspective suggests (Bush et al. 2015). Since actors have interactions and interrelations with each other in a network structure, the network perspective provides more real information to better understand sustainability beyond a firm's boundaries (Miemczyk, Johnsen & Macquet 2012). As a result, considering other stakeholders rather than those that link directly to the SCM processes is the essential pre-requisites of sustainability in business (Frostenson & Prenkert 2015).

3.4 Sustainability issues in the supply chain network

Based on the various definitions of SSCM, it seems essential that the unit of analysis in the SSCM needs to be analysed through an inter-organisational network, which

includes various types of actors at the macro-environmental level (Matthews et al. 2016). For example, the global level of sustainability includes a complex network of various global and local, private and public actors (Nadvi 2008). This is important as the sustainability issues in the extended network (such as from both direct and indirect suppliers as well as customers) have a significant impact on a firm's business performance (Shokri-Kahi et al. 2017; Miemczyk, Johnsen & Macquet 2012). Therefore, researchers have suggested an application of the network perspective in addressing the sustainability issues within the firm's SCM (Matthews et al. 2016; Miemczyk, Johnsen & Macquet 2012).

3.4.1 Creating the sustainable development objectives in the SCN

By looking at the SSCM from a network perspective, a sustainable supply chain network (SSCN) can be defined as a set of actors who work together to create a "sustainable circular economy" through considering the potential for social and environmental issues across the various stages of the product life cycle (Winkler 2011, p. 244). Firms typically consider the broad network of actors when attempting to ensure that stakeholders' expectations about sustainable development objectives are met (Ferro et al. 2017). The benefit of adopting this perspective is that some actors are able to compensate for others in the network, thus enabling the firm to meet its sustainable development objectives (Miemczyk, Johnsen & Macquet 2012). For example, in the case of having the network perspective for sustainable purchasing, Hadjikhani and Thilenius (2005) highlight that aside from integrating both indirect and direct suppliers in the firm's value creation process, the firms need to consider non-business actors such as regulation and standard institutions, the media, ecological foundations, labelling organisations and the government. In this view, firms can achieve sustainable development goals in their SCN based on their relationships with other actors (Crespin-Mazet & Dontenwill 2012). This means that the achievement of sustainability can occur through involving multiple interconnected actors who may themselves have different objectives (Ferro et al. 2017).

A SSCN can be considered a cornerstone of firms' sustainable development strategies, and developing such a sustainable network needs firms to evaluate their SCN actors

with the improvement of social and environmental aspects (Snabe 2009). However, achieving sustainable development objectives in the SCN needs a key actor, which has sufficient resources to play a lead role (Alvarez, Pilbeam & Wilding 2010). This is mainly because they have more capabilities to generate reports and systematically pursue the sustainability issues in the extended network (Elg & Hultman 2011). In most cases, the focal firm refers to the actor which is implicitly implied as the core actor driving sustainability in the SC (Beske-Janssen, Johnson & Schaltegger 2015). As a result, "the focal firm is assumed to be a structurally identifiable, indivisible, unambiguous and coherent entity that has the capacity of managing and implementing sustainability more or less in a hierarchical line of command, albeit in a setting where many constituents need to be taken into account" (Frostenson & Prenkert 2015, p. 86). In addition, one study indicates around two-thirds of industrial CO_2 emissions in the world come from ninety firms (Heede 2014). Therefore, large firms seem to be the appropriate starting point to follow up on sustainability issues in their SCN (Beske-Janssen, Johnson & Schaltegger 2015).

3.4.2 Focal firms

Recently, a growing number of large firms have attempted to employ various sustainability practices within their SCN (Frostenson & Prenkert 2015; Meinlschmidt, Schleper & Foerstl 2018; Wilhelm et al. 2016b). They have realised that managing sustainability issues in the environment, which includes only their immediate SCN actors (such as first-tier suppliers) may not be effective (Tachizawa & Wong 2014). Customers are more likely to attribute to the accountability of the sustainable behaviour to large firms, even though they may not have sufficient influence over their suppliers (Hartmann & Moeller 2014). Consequently, many focal firms are starting to recognise new ways of managing sustainability issues beyond the first-tier actors to address their SCN liabilities (Hartmann & Moeller 2014). For example, Nike is controlling sustainability issues with its second-tier suppliers for its footwear and apparel production, and Puma has decided to manage its sustainability issues with its fourth-tier suppliers (Lee, Plambeck & Yatsko 2012).

In SSCM, Seuring and Müller (2008, p. 1699) define focal firms as "those firms that usually (1) rule or govern the SC, (2) provide the direct contact to the customer, and (3) design the product or service offered". Furthermore, NGOs and the public expect the focal firms to take responsibility for sustainability issues over its SCN (Beske-Janssen, Johnson & Schaltegger 2015). Consequently, many focal firms are starting to recognise new ways of managing sustainability issues beyond the first-tier suppliers (those suppliers who work directly with the focal firms) to address their SCN liabilities (Hartmann & Moeller 2014). Glover et al. (2014) argue there is a need for a dominant player in the chain to institutionalise the sustainability agenda in the SCN. The focal firms have both power and motivation to monitor and manage sustainability performance within the SCN. Accordingly, the literature on SCN suggests the focal firm can play a leading role to improve sustainability in its SCN, due to its closeness, capabilities and the ability to create an effective relationship with the various actors within the SCN (Tachizawa & Wong 2014). In pursuing sustainable development objectives, focal firms have realised that managing sustainability issues in this context, which includes only their immediate SCN actors may not be effective (Tachizawa & Wong 2014). End customers are more likely to attribute the accountability of the sustainability issues to the focal firms, even though they may not have sufficient influence over their SCN actors. Therefore, focal firms seem to be the appropriate starting point to follow up on sustainability issues in their SCN (Beske-Janssen, Johnson & Schaltegger 2015).

In most cases, the focal firms have also engaged with its SCN actors to create a win-win situation and help them to improve their business process (Schaltegger & Wagner 2017). The focal firms are expected to usually set or implement sustainability criteria for both products and processes (Frostenson & Prenkert 2015). For example, in the case of Grona Konsum, the new environmental strategy to recycle waste, pushed the focal firm to improve the business process in several different areas. The process and setting were different, for example, in the production network, the transportation network, and the raw material extraction network (Andersson & Sweet 2002).

Therefore, the focal firms need to understand the number of business processes in each related area.

3.4.3 The impact of sustainability issues on the business process

It is essential for the focal firms to recognise the business processes within the SCN due to their potential profits and risk opportunities (Winter & Knemeyer 2013). As defined by Lambert (2008, p. 2), SCM can be defined "the integration of key business processes from end-user through original suppliers that provides products, services, and information that add value for customers and other stakeholders". This definition highlights the approach that emphasises the importance of the business process in both inter-organisation and intra-organisation functions.

SSCM is very useful because the incorporation of sustainability into SCM involves not only the various business process within a single firm but also collaboration among the various types of actors across the network of relationships that form a SCN (Winter & Knemeyer 2013). The role of business processes in the sustainable development goals is important. For example, according to the SSCM definition provided by Carter and Rogers (2008, p. 368), SSCM is "the strategic, transparent integration and achievement of an organisation's social, environmental, and economic goals in the systemic coordination of key inter-organisational business processes for improving the long-term economic performance of the individual firm and its supply chains". Thus, the business process cuts across the various functions within the focal firm and across the focal firm's SCN (Lambert 2008).

The business process can be defined as a series of activities, performing to achieve the specific business outcomes. The two important characteristics of business processes are having customers and cutting across the firms' boundaries (Davenport & Short 1990). Applied to the definitions of SSCM, the business processes are used to structure specific inter-functional activities across the SCN. Eight key business processes can be identified in SCM in which the focal firms could analyse them in terms of sustainable development goals, including manufacturing flow management, customer service management, order fulfilment, demand management, supplier relationship

management (SRM), CRM, commercialization, product development and returns management (Winter & Knemeyer 2013). These process can assist firms to reach their business goals.

As mentioned by various researchers such as Pádua and Jabbour (2015), incorporating sustainability into action is a challenging task. The challenge is mainly related to finding the balance between the three dimensions of sustainability (Dubey et al. 2017). This issue can be addressed by managing sustainability through the business process (Sarkis, Meade & Presley 2006). In this regard, many researchers have been trying to study the incorporation of sustainability into the business process (Pádua & Jabbour 2015). Incorporating sustainability into the business processes aims to improve business process efficiency, focuses on the processes that add value and eliminates processes that do not have added value (Witjes, Vermeulen & Cramer 2017). The process standardisation has a significant impact on general performance as it can reduce the execution time, cost, and improves the quality (Münstermann, Eckhardt & Weitzel 2010). In support, González et al. (2010) argue that the improvement of a firm's processes is the key factor in business performance. Accordingly, through the restructuring of business processes, it is possible to achieve sustainable performance of business processes and at the same time maintain the high performance (Hoesch-Klohe & Ghose 2010). However, these studies raise the need to examine the appropriate tools to improve sustainability performance while integrating sustainability into the business processes, as many tools and techniques which have been used to integrate sustainability into the business process, mainly have an application in the environmental dimension of sustainability and have failed to provide integration with the other two aspects (Pádua & Jabbour 2015). Thus, the focal firms need to understand how the business processes could be connected to the three dimensions of sustainability. In other words, they need to identify sustainability practices that make their firms more competitive. For example, by recycling and waste reduction, the focal firms are pursuing competitive advantage through covering the sustainability inefficiencies in their business processes (Sarkis, Meade & Presley 2006).

3.4.4 The impact of sustainability issues on the business practices

As the interest for the sustainable development objectives has increased in the last ten years (Tajbakhsh & Hassini 2015), firms are realising that developing sustainability practices can be economical and have numerous benefits through creating new revenue direction and increasing employee and customer satisfaction (Mincer 2008). A sustainable firm contributes to sustainable development by simultaneously considering the social, environmental and economic dimension of sustainability and putting them into practice (Faisal 2010).

The main idea originates from waste minimisation in the SCM as the waste decreases the economic benefits (Sarkis, Zhu & Lai 2011). These early intentions towards environmental issues were accelerated by the new stream of optimising economic performance through minimising the environmental impact of SCM (Beske & Seuring 2014). The stream was started in green supply chain management (GSCM) which mainly paid attention to the environmental aspect of sustainability (Ali et al. 2017; Chin, Tat & Sulaiman 2015). By expressing doubts about GSCM practices providing a source of competitive advantage, greater interest occurred in SSCM practices (Dubey et al. 2017). Wu, Santoso, and Roan (2017) also argue that the performance of SSCM can be improved by GSCM practices. The comprehensive definitions of both terms can be found in the work of Ahi and Searcy (2013). Firms applying the GSCM and the SSCM practices, are motivated by the value and are typically following the sustainable policies to improve the sustainable performance (Beske & Seuring 2014). Therefore, a growing number of firms are applying various types of sustainability practices to make their SCN more sustainable. As mentioned, most works related to the SSCM have been analysed from the focal firms' perspective as being the initiator of sustainability practices in the SCN. Such big firms have the intention to improve their sustainability performance and consequently asking their SCN actor to have the same attention (Bloemhof et al. 2015; Gimenez & Tachizawa 2012; Miemczyk, Johnsen & Macquet 2012; Wilhelm et al. 2016a). This intention has led to the various related sustainability practices in SSCM.

Before discussing various sustainability practices in the literature, it is essential to understand what the practices mean. The term practice means “the customary, habitual, or expected procedure or way of doing something” (Beske & Seuring 2014, p. 323). This definition is in line with the application of the term management practices in various parts of management literature such as quality management (Beske & Seuring 2014), which assist to identify sustainability practices within the literature.

The task of applying the particular types of relationships which include sets of sustainability practices is quite challenging. Firstly, some focal firms may not have sufficient influence over the other actors within their SCN to compel them to be conduct sustainability practices in their SCN (Awaysheh & Klassen 2010). Secondly, some firms in the focal firm’s SCN may be too visible to the end-users, the public, and the other actors. Thus, any misbehaviour in terms of sustainability issues from their side, may have irreparable side effects on the focal firm’s reputation (Roscoe, Cousins & Lamming 2016). Thirdly, as the length of the supply chain which can be consider by the number of tiers increases, the availability of accessing the relevant information will be decreased (Koplin, Seuring & Mesterharm 2007). Furthermore, sustainability practices in firms cannot be developed in isolation, but instead they should be developed based on the various actors‘ characteristics, both upstream and downstream in the SC (Awaysheh & Klassen 2010) and the interactions among multiple stakeholders within a network (Parmigiani, Klassen & Russo 2011). As a firm’s behaviour is highly dependent on the structure of interactions with the other actors in the network (Ritter, Wilkinson & Johnston 2004; Wilkinson & Young 2002), the position of the actors and the pattern of relationships among them within a SCN structure have significant sustainable implications, and cannot be ignored (Fabbe-Costes, Roussat & Colin 2011; Touboulic & Walker 2015). Thus, it suggests it may be beneficial to analyse the SCN structure and determine how it can affect the firm’s behaviour and strategy.

3.5 The impact of supply chain network structure on RMS

RMS can provide an effective contribution to the social, environmental and economic sustainability of the SCN (Cheung & Rowlinson 2011) by finding a balance between

the various actors in the SCN to achieve long-term sustainability. Under an effective RMS, the focal firms can ensure a win-win situation for all the actors (Cheung & Rowlinson 2011). By doing so, the focal firms need to interact with the various SCN actors to improve the sustainable performance of the SCN (Bhardwaj 2016). For example, fair trade needs the focal firms to develop and maintain a strong relationship with buyers, NGOs, and the other actors in the SCN (Raynolds, Murray & Leigh Taylor 2004). In support, Davies (2009) indicates how the value is created by making alliances and close partnership within the SCN as in the case of fair trade. By considering only the layers of customers and suppliers, Vachon and Klassen (2006) argue that the focal firms develop the collaborative types of relationships with those suppliers and customers with which the focal firms have high levels of both technological and logistical integration. However, these studies did not consider the complete pattern of interactions among the different SCN actors and have not clearly shown how a focal firm can choose particular types of relationships with those selected actors.

As the SCN environment is complex, it is challenging for the focal firm to take strategic actions to achieve competitiveness unless it analyses the SCN in the way in which the SCN operates (Chang, Chiang & Pai 2012; Ekanayake, Childerhouse & Sun 2017). As Snehota and Hakansson (1995, p. 18) stated over two decades ago, “as managerial action is guided by how situations are framed, the relationship perspective and the network approach are unquestionably of consequence to management”. A SCN consists of interrelated firms that are involved in various activities from extracting the raw materials to delivering the final product to the end-customer (Harland et al. 2001; Lamming et al. 2000). It is then essential to analyse the influences that the various SCN actors have on the focal firm’s processes of determining a governance mechanism to be incorporated into the different types of relationships (Alvarez, Pilbeam & Wilding 2010; Pullman et al. 2017). For example, the choice between various approaches to measuring the sustainability performance such as through a focal firm, all actors in the SCN, or an independent third party actor (Beske-Janssen, Johnson & Schaltegger 2015), is highly dependent on the focal firm’s

capabilities and resources in having sufficient resources and legitimacy to play a lead role in the SCN (Alvarez, Pilbeam & Wilding 2010), and also the patterns of interactions among the SCN actors (Roscoe, Cousins & Lamming 2016). Thus, it is important to examine the network structure of SC interactions (Alvarez, Pilbeam & Wilding 2010).

Various researchers have attempted to analyse the role of the SCN structure in the focal firms' decision-making process regarding sustainability objectives. For example, Vachon and Klassen (2006) argue that two characteristics of the SCN can affect the adoption of green supply chain practices. These characteristics are logistical integration, such as the degree of cooperation in managing material flows between the focal firm and its suppliers and customers', and technological integration, such as the degree of information sharing between the focal firm and its suppliers and customers. They argue that as the technological and logistical integration increase, the focal firms tend to adopt collaborative practices. In contrast, as the integration of these aspects decreases, the focal firms typically adopt the monitoring practices (Vachon & Klassen 2006). The tenet behind these behaviours, for example, is that having a large supplier base can enhance the likelihood of sustainable misconduct by one or more suppliers, such as non-compliance with the emission standards or the unsafe working conditions in sweatshops within the developing countries. Therefore, to respond quickly and reduce the risk of environmental and social issues, focal firms design more complex monitoring systems in their SCN. In contrast, by having fewer suppliers or customers, the focal firms have a tendency to shift from a pure transaction-oriented approach towards a more collaborative one through moving their attention and rare and valuable resources from monitoring systems to the mutual improvement outcomes (Vachon & Klassen 2006). This is also supported by various research such as Khalid et al. (2015) which show that with a limited number of actors in the SCN, the focal firms usually tend to develop the long-term relationships. However, they did not consider the interactions among the identified actors with each other as they only analyse the interactions between the focal firm and its suppliers and customers.

Similarly, MacCarthy and Jayarathne (2012) analyse two case studies in which two large retailers employ different types of relationships (collaborative and monitoring) to make their SCN more sustainable. They found that based on the economic criteria, both focal firms were successful in incorporating sustainability into their SCN (MacCarthy & Jayarathne 2012). Although they did not clarify when the focal firm should choose either of those distinctive types of relationships, it seems that the position of the firms is the main influential factors. It can be realised that, in the first case, as the focal firm (the retailer) has the ability to influence other actors in the SCN, the focal firm applies more proactive approaches (collaborative relationship). This is mainly because the retailer usually develops a range of designs and sends them to the prime manufacturer. In the second case, as the focal firm (the retailer) has insufficient ability to exert influence over their SCN actors (the prime manufacturer often develops the designs), the focal firm employs a more reactive approach (transactional relationship). However, it is still not clear what gives the retailer and the prime manufacturer the power to influence each other and what relationships they may have with other actors in the SCN, which can affect their positions.

There are also other types of relationships which the focal firms can apply to their SCN actors. For example, to create the legitimacy of sustainability in the SCN, the focal firm may end a relationship with some suppliers (such as those that are not legitimate or certified in the environmental and social issues), develop business volume with existing certified suppliers, build a relationship with new legitimate suppliers, and create a close partnership with NGOs (Crespin-Mazet & Dontenwill 2012). Furthermore, the focal firms' expectation of achieving a specific outcome in sustainability performance is mainly related to the types of relationships with the various actors in the SCN (Roscoe, Cousins & Lamming 2016). For example, Roscoe, Cousins and Lamming (2016) argue that to develop eco-innovations (innovation that improves environmental performances) in the SCN, the focal firms need various types of relationships, including the building of weak relationships with multiple small actors and other actors that bridge 'structural holes' and build strong relationships with the strategic actors in the network. On the basis of a review of SSCM studies, Seuring

(2011) identifies that focal firms usually engage with their suppliers to help them improve their business processes by providing a win-win situation with respect to sustainability issues. However, it is not clear how focal firms identify which actors in their SCN are strategic and which actors, for example, bridge the structural hole based on the pattern of interactions among the various SCN actors. Thus, it is of interest to examine the network structure of SC interactions (Addo-Tenkorang et al. 2017).

3.5.1 Factors to conceptualise the supply chain network structure

The analysis of SCM in which sustainability practices are implemented from the network perspective can determine which RMS is most effective (Tachizawa & Wong 2014). Studies on sustainable development that incorporate the network perspective into SCM, such as that of Frostenson and Prenkert (2015), highlight that firms need to understand the embeddedness of SCN actors since it can limit an individual firms' actions (Miemczyk, Johnsen & Macquet 2012). Thus, the structure or pattern of interactions among the firms and its SCN actors can influence the behaviour of the firms within the network (Roscoe, Cousins & Lamming 2016; Pullman et al. 2017).

The pattern of interactions in the network can be analysed at two levels. The first level, which is referred to as the node level (Bellamy & Basole 2013), is about how a firm is in control of other SCN actors (such as the focal firm) and is concerned with the management of interactions between two SCN actors (Ritter, Wilkinson & Johnston 2004). The second level, which is referred to as the network level (Bellamy & Basole 2013), is about how a firm can influence and be influenced regarding the function of the whole network (Ritter, Wilkinson & Johnston 2004). "The extent to which actors in the SCN are connected to each other and their relative position matter in shaping reciprocal influences and acceptance within the network" (Vurro, Russo & Perrini 2009, p. 612). For example, a focal firm with low power over a SCN actor may result in a lack of influence over its practices (node level), and a SCN actor's poor interconnectedness within the network can impede the transmission of stakeholder pressure on its performance (network level) (Gualandris & Pagell 2015). Thus, how much a focal firm can address sustainability issues within a specific SCN actor depends largely on the level of influence it has on the other SCN actors and the level

of information that other SCN actors (stakeholders) can access regarding this SCN actor (Parmigiani, Klassen & Russo 2011).

Due to the importance of the level of influence and level of information availability in developing strategic actions to successfully respond to competition within the SCN (Chang, Chiang & Pai 2012; Parmigiani, Klassen & Russo 2011; Vurro, Russo & Perrini 2009), this research extends the work of Awaysheh and Klassen (2010) by analysing the supply chain structure from the network perspective, and suggests there are four factors that require consideration. These factors can be used to conceptualise the pattern of interactions in the SCN structure, and consequently have significant impacts on the RMS implemented by the focal firms: dependency, distance, power, and transparency. This research applies these four factors, by examining two levels of influence and information availability from both the node and network level to conceptualise the SCN structure.

The level of influence in a dyadic relationship can be characterised by the dependency which comes from a power imbalance (asymmetrical interdependence) that happens if one firm is more dependent than the other firm (Touboulic, Chicksand & Walker 2014). Therefore, at the node level, "power is deeply rooted in interdependence, so the more dependent one actor is on another, the more power the latter has over the former" (Egels-Zandén, Hulthén & Wulff 2015, p. 101). However, power is not limited to a dyadic relationship in which two actors interact but also resides within the network in which the firm is embedded and can affect the firm's strategies and behaviour (Meqdadi, Johnsen & Johnsen 2016). Therefore, the level of influence at the network level can be characterised by the power which can come from a variety of resources such as having a high market share or highly differential technology (Chang, Chiang & Pai 2012).

The level of information availability at the node level can be characterised by the distance between two actors. "The ease and effectiveness of information and knowledge access by a focal firm from members in the supply network is influenced by the distance between each member and the focal firm in terms of the mean length

of the path between them" (Bellamy, Ghosh & Hora 2014, p. 359). The level of information availability at the network level can be characterised by the firm's transparency which can take the form of, for example, sustainability reports, environmental product declarations, and sustainability certifications (Egels-Zandén, Hulthén & Wulff 2015). The transparency reflects the degree that the information is available in appropriate quantity and quality for all the firm's stakeholders (SCN actors) (Wognum et al. 2011), and can be considered as a "foundational tool" for addressing stakeholder pressure and improving responsible management practices within a SCN (Parris et al. 2016, p. 223). Thus, to survive in the competitive marketplace, firms need to clearly respond to stakeholder pressure by information processing and increased transparency to positively improve the firms' reputation (Wognum et al. 2011).

As shown in Table 3-1, those factors are categorised into two levels. At the node level, the level of influences can be identified by how much a SCN actor is dependent on the focal firm, and the level of information availability can be identified by how much distance exists between the focal firm and a SCN actor. At the network level, the level of influence can be identified by how much a SCN actor is considered powerful in the network, and the level of information availability can be identified by how much a SCN actor is transparent. Table 3-1 provides definitions and examples of these four factors. Additional details on each of these factors are explained in the following four sub-sections.

Table 3-1. Four factors to analyse the SCN structure

Level	Factor	Definition	Example
Node level	Dependency	The extent to which a SCN actor relies on a focal firm for critical resources, components, or capabilities.	• How many alternative buyers (existing or potential) do suppliers have for a product? (Touboulic, Chicksand & Walker 2014) • The importance of this supplier to a focal firm? (Jorge & Jerónimo 2017) • The percentage of a SCN actor's sales is generated by a focal firm? (Caridi et al. 2010) • How much time a focal firm requires to change to new suppliers? (Awaysheh & Klassen 2010)

Table 3-1. Four factors to analyse the SCN structure (continued)

Level	Factor	Definition	Example
Node level	Distance	The extent to which a SCN actor is far from a focal firm.	• How many tiers exist between a focal firm and suppliers or customers? (Awaysheh & Klassen 2010) • How far the SCN actor's headquarter location from a focal firm? (Griffith & Dimitrova 2014) • How far are is a SCN actor and a focal firm from each other geographically? (Watson et al. 2018) • The distance between the capital cities of a focal firm's home country and the host country? (Campbell, Eden & Miller 2012)

Table 3-1. Four factors to analyse the SCN structure (continued)

Level	Factor	Definition	Example
Network level	Power	The ability to influence other SCN actors' behaviours.	• The number of direct ties that each actor has, divided by the maximum number of direct ties that the actor can have in the SCN (Kim et al. 2011) • How frequently a SCN actor meets all other SCN actors? (Mena, Humphries & Choi 2013) • The balance of power between a focal firm and suppliers? (Meinlschmidt, Schleper & Foerstl 2018) • How much market share a SCN actor has? / How much a SCN actor does offer unique or highly differential technology, products, or key components to other SCN actors? (Chang, Chiang & Pai 2012)
	Transparency	The extent to which a SCN actor is visible to other SCN actors.	• How much information, such as operational plans, related to a SCN actor is exchanged with the other SCN actors? (from 1 (low rate) to 4 (best rate)) (Caridi et al. 2010) • How much the end-user is aware of how the product is manufactured? Or where do the raw materials come from? (Awaysheh & Klassen 2010) • How much information is available by a SCN actor? / Is the information easy to understand? (Parris et al. 2016) • How much a SCN actor does know where and how the products are produced? (Egels-Zandén, Hulthén & Wulff 2015) • How often does a SCN actor exchange and share information with other SCN actors? (Pant, Prakash & Farooquie 2015)

3.5.1.1 Dependency

In the SCN, dependency is concerned with the extent to which a firm relies on the other actors of the SCN for their resources and capabilities (Wilhelm et al. 2016b). Dependency theory (Pfeffer & Salancik 1978) suggests that as the number of potential suppliers for a firm reduces in its supply base, the firm's influence on the suppliers decreases. Accordingly, this factor can have a significant impact on the focal firm's behaviour (Jorge & Jerónimo 2017; Meinlschmidt, Schleper & Foerstl 2018; Wilhelm et al. 2016b). As discussed in Chapter Two, Ritter, Wilkinson and Johnston (2004) present a framework which categorises four types of relationships strategies between two firms in the network based on how dependent they are on each other. The focal firm has a limited ability to influence and control changes in the operations of its suppliers if the focal firm is highly dependent on its suppliers (Awaysheh & Klassen 2010). Signaling by the focal firm is less likely to motivate the suppliers' actions regarding the specific objectives if the focal firm is dependent on the supplier (Dixit & Nalebuff 1993).

In this regard, the role of the dependency in SCM has gained considerable attention among researchers (Gulati & Sytch 2007; Hoejmose, Grosvold & Millington 2013; Musyoki & Ngugi 2017; Sanzo et al. 2007; Steinle, Schiele & Ernst 2014), particularly in the application of the SSCM practices (Meinlschmidt, Schleper & Foerstl 2018; Tachizawa & Wong 2014; Wilhelm et al. 2016b). For example, Awaysheh and Klassen (2010) argue that as dependency on customers increases, the focal firms have more tendency to apply socially responsible practices. This is mainly related to the extent of the influence which customers can exert on the focal firm to implement sustainability practices (Delmas & Montiel 2009). However, they could not find enough evidence to find such a relationship when the focal firms were dependent on their suppliers. In a comprehensive literature review, Tachizawa and Wong (2014) identified dependency as being the main variable which can affect the approaches implemented by the focal firm to manage sustainability issues in their SCN. Various researchers who address dependency in their work are summarised in Table 3-2.

Table 3-2. The impact of dependency on firm's behaviour within SCM

Factor	Definition	Application	Definition source
dependency	"The degree to which a firm relies on other actors of the supply chain for critical resources, components, or capabilities".	Adoption of socially responsible practices in suppliers and customers within the supply chain.	(Awaysheh & Klassen 2010, p. 1250)
		Adoption of a proactive approach to manage the sustainability of multi-tier supply chains and sub-suppliers.	(Tachizawa & Wong 2014, p. 657)
	"The extent to which a buyer and a supplier rely on one another within the relationship".	The implementation of socially responsible supply chain management (SR-SCM) practices in buyer-supplier relationships.	(Hoejmose & Adrien-Kirby 2012, p. 278)
	"The extent to be in a weak negotiation position in the buyer-supplier relationship".	The application of corporate social responsibility in the SCM.	(Spence & Bourlakis 2009, p. 292)
	"The extent to which supplier's products and services are of vital importance to buyer".	Implementation of CSR practices in suppliers.	(Pedersen & Andersen 2006, p. 232)
	"The ability to have control over certain resources in another firm".	Implementation of sustainability practices between a large focal firm and its small suppliers.	(Touboulic, Chicksand & Walker 2014, p. 580)

3.5.1.2 Distance

As distance increases, focal firms have some difficulties related to data gathering, evaluation, and implementation (Carter, Rogers & Choi 2015). Three sub-factors can conceptualise the distance in the SCN, including geographical distance which is related to the physical distance between actors in the SCN (Griffith & Dimitrova 2014; Watson et al. 2018), cultural distance which refers to the cultural differences that exist between the societies in which the firms are located (Grewal et al. 2018; Tihanyi, Griffith & Russell 2005), and organisational distance which is concerned with the number of tiers that exists among the various actors in the SCN (Awaysheh & Klassen 2010; Parmigiani, Klassen & Russo 2011; Roth et al. 2008). As the distance between the actors in the SCN increases, focal firms make more effort in coordination activities (Mares 2010; Simpson, Power & Samson 2007; Bellamy, Ghosh & Hora 2014; Carter, Rogers & Choi 2015). This may happen due to the numerous difficulties in establishing trust and developing rich exchanges of information as a result of too much distance, making it more complex to create an environment for coordination and collaboration (Parmigiani, Klassen & Russo 2011). Griffith and Dimitrova (2014) found that effective interfirm communication is essential to reach the maximum benefits of strong relational networks. Distance can also be considered as a significant factor in determining the nature of an international interfirm marketing collaboration (Dahlquist & Griffith 2015). Therefore, the effect of this factor on SSCM needs to be analysed (Dubey, Gunasekaran & Papadopoulos 2017; Meinlschmidt, Schleper & Foerstl 2018; Wilhelm et al. 2016b).

Similarly, a multi-industry survey of Canadian focal firms shows a positive relationship between the length of a SC and the adoption of socially responsible practices within the SC. As the number of tiers increases, the extent of complexity and uncertainty increases, and focal firms adopt more complex monitoring systems such as auditing social issues in the suppliers based on the standards, to improve the sustainability of their SC (Awaysheh & Klassen 2010). In addition, Hoejmose, Grosvold and Millington (2013) argued that two factors named joint dependency and buyer power become increasingly significant determinants of socially responsible

practices as geographical distance increases. Thus, distance can be a significant factor which can affect the types of relationships the focal firms can choose in their SCN (Tachizawa & Wong 2014). Table 3-3 summarises sources who address distance in their work.

3.5.1.3 Power

In a SCN, power is a firm's ability to influence and control other actors (Pilbeam, Alvarez & Wilson 2012). Power can come from various resources, such as having a high market share, high growth demand, highly distinctive technology, critical components and products, high prestige and reputation, and being in a high concentrated and consolidated part of the industry structure (Chang, Chiang & Pai 2012). These aspects can mainly affect the relationship success of the various actors in the SC (Bandara et al. 2017), and have been considered a great area of interest for various researchers such as business-to-business marketing researchers (Johnsen & Lacoste 2016). Huxham and Beech (2008) consider resources and legitimacy as being the two main sources of power for focal firms in the SC. For example, possessing access to rare resources such as technology infrastructure can provide more powerful position for the focal firms over their SCN actors in their SCN (Alvarez, Pilbeam & Wilding 2010). In addition, developing various types of relationships with the SCN actors, which are legitimate, for example, in the case of having knowledge and experience of sustainability, gives the focal firms more power to influence the other SCN actors to follow up their own CSR policies and procedures (Crespin-Mazet & Dontenwill 2012). Having valuable resources and the horizontal position of the focal firm in the SCN, which related to the position of the focal firms at each level of customers' customer, customer, supplier, suppliers' supplier, can be considered as two sources of the power (Mena, Humphries & Choi 2013). Similarly, a firm's structural position within its SCN can affect the firm's power and influence over the other actors within the SCN (Kim et al. 2011). Table 3-4 indicates the common sources of inter-firm power in SCM (Zhao et al. 2008, p. 370). By believing a source (e.g. customers) knowledge and skill (expert power), reputation and image (referent power), and legitimacy of authority (legitimate power); the targets (e.g. suppliers) determine

whether and how much the sources can influence them. In contrast, by creating positive opportunities (such as placing purchase orders in a large amount) in reward power and creating negative opportunities (such as cancelling purchase orders for specific products) in coercive power, the sources will decide when and how they can influence their targets (Zhao et al., 2008). In comparison to dependency, power is not limited to a dyadic relationship in which two actors interact, but also resides within the network in which the firm is embedded and can affect the firm's strategies and behaviour in related to the network (Chang, Chiang & Pai 2012; Meqdadi, Johnsen & Johnsen 2016).

Table 3-3. The impact of distance on firm's behaviour within SCM

Factor	Definition	Application	Definition source
Distance	"The physical, cultural, and social differences among actors".	Adoption of proactive approach to manage the sustainability of multi-tier supply chains and sub-suppliers.	(Tachizawa & Wong 2014, p. 657)
	"The geographical, cultural, and organisational differences among actors".	Adoption of social responsible practices in suppliers and customers within the supply chain.	(Awaysheh & Klassen 2010, p. 1251)
	"The physical and cultural differences among actors".	Adoption of the international environmental management standard ISO 14001 in the buyer-supplier relationships.	(Delmas & Montiel 2009, p. 177)
	"The geographic distance among actors".	The implementation of socially responsible supply chain management (SR-SCM) practices in buyer-supplier relationships.	(Hoejmose, Grosvold & Millington 2013, p. 278)
		The propensity of the firm to certify with the ISO 14001 management standard.	(King, Lenox & Terlaak 2005, p. 1096)
	"The geographical, cultural, and institutional differences among actors".	Understanding of CSR practices in the multinational enterprises (MNEs).	(Campbell, Eden & Miller 2012, p. 90)

Table 3-4. Bases of inter-firm power

Power base	Description	SCN example
Expert power	Source has access to knowledge, skill and technology desired by target.	The retailer knows about the end-consumer's demands and has capabilities to design and distribute new products to the end-consumer (MacCarthy & Jayarathne 2012).
Referent power	Target values identification with source.	Creating relationship with NGOs can offer an attractive reputational resources to the manufacturer (Alvarez, Pilbeam & Wilding 2010).
Legitimate power	Target believes source retains natural right to influence it.	Supplier believes that manufacturer has sufficient competency to ask for developing new capabilities and processes (Crespin-Mazet & Dontenwill 2012).
Reward power	Source has the ability to mediate rewards to target.	Customer has the ability to provide incentive for suppliers through enlarging order volume if they follow codes of conduct (Andersen & Skjoett-Larsen 2009).
Coercive power	Source has the ability to mediate punishment to target.	Customer can terminate the business relationship with a supplier in case of non-compliance with the customer's demand for the sustainability standard (Pedersen & Andersen 2006).

Source: Adapted from Zhao et al. (2008)

Within the SCN, power plays a critical role in the adoption of sustainability practices (Meinlschmidt, Schleper & Foerstl 2018; Tachizawa & Wong 2014; Wilhelm et al. 2016b) and particularly can affect the depth of the collaboration between the focal firms and the other SCN actors (Kähkönen 2014). For example, a powerful focal firm can reqire the necessary sustainability standards are met by suppliers (Ciliberti et al. 2009), and in contrast, the lack of sufficient power over the suppliers can limit the enforcement of sustainability practices in the SCM (Hoejmose, Grosvold & Millington 2013). Thus, considering power as being a significant factor can help focal firms to decide which types of approaches can be effective under specific circumstances (Tachizawa & Wong 2014). Various researchers who address power in their work are summarised in Table 3-5, which shows the majority of the definitions are rooted in five sources of power.

Table 3-5. The impact of power on firm's behaviour within SCM

Factor	Definition	Application	Sources of power	Definition source
power	"The ability to influence the activities of other actors of the SCN".	Adoption of a proactive approach to manage the sustainability of multi-tier supply chains and sub-suppliers.	Possession of resources such as the ability to offer contracts, and supply chain position such as proximity to the market.	(Tachizawa & Wong 2014, p. 657)
	"The ability to get another actor to do something they would not otherwise have done, and therefore exploiting a superior position for one's own benefit".	The engagement of the SCN actors in sustainability initiatives.	• Expertise power • Referent power • Reward power • Coercive power	(Meqdadi, Johnsen & Johnsen 2016, p. 2)
	"The extent to which the focal firm can exert influence over SCN actors".	Selection of the appropriate actions towards addressing social and environmental issues in SCN actors.	• Possessing both greater market power and production knowledge. • Being industry leaders	(Parmigiani, Klassen & Russo 2011, p. 215)

Table 3-5. The impact of power on firm's behaviour within SCM (continued)

Factor	Definition	Application	Sources of power	Definition source
power	The ability to influence and control other SCN actors	Selection of governance mechanisms and their evolution over time to make the SCN more sustainable.	Possessing or being able to access critical resources including financing, legitimacy, and strategic allies.	(O'Callaghan & Murray 2017)
		The implication of the sustainability concept in multi-tier supply chains.	• Accessing to global markets. • Acting as an intermediator to enable information flows and coordinating physical flows. • Being the conduit to the market (positional power).	(Mena, Humphries & Choi 2013)
		Analysing CSR practices in global supply chains.	• Control over key resources needed in the supply chains. • Size of the firm. • Design of the firm's global supply chains. • Financial resources. • Reputation.	(Kähkönen 2014)

3.5.1.4 Transparency

Transparency refers to the degree to which information is readily available to the public, the end-consumers, and the other actors within the SCN (Awaysheh & Klassen 2010). For example, as institutional pressure becomes more intense, focal firms become more visible to the various stakeholders such as media (Simpson, Power & Klassen 2012). In this regard, focal firms typically show more intention towards a proactive approach to adopt and manage sustainability practices in their SCN (Esty & Winston 2009; Meinlschmidt, Schleper & Foerstl 2018; Wilhelm et al. 2016b). Large firms with visible brand names may pay more attention to protecting themselves against the criticism of sustainability commitments such as social issues in their SCN (Awaysheh & Klassen 2010). Focal firms' misbehaviour in terms of the sustainability issues can heavily damage their reputation because the technology improvement such as the social media and the Internet accelerates the dissemination of information received by customers which can affect the customers' behaviour negatively (Tapscott & Ticoll 2003). Therefore, the extent to which the SCN actors are transparent or subjected to various stakeholders such as the public, the media, government agencies, activists and NGOs can influence the degree to which a focal firm proactively applies the sustainability practices, for example, related to social issues (Awaysheh & Klassen 2010).

Alternatively, those actors with lower public visibility to the stakeholders such as the end-users tend to implement a more passive approach, waiting longer to create a relationship with the other SCN actors in their SCN (Simpson, Power & Klassen 2012). In a comprehensive literature review of practices in GSCM, Sarkis, Zhu and Lai (2011) explain that as the extent of visibility increases, the ability of the SCN actors to resist stakeholder pressure decreases. They also suggest that increasing general awareness of the public and other stakeholders in the SCN can affect the diffusion of GSCM practices from the proactive approach to the lagging one (Sarkis, Zhu & Lai 2011).

Similarly, Parmigiani, Klassen and Russo (2011, p. 215) used accountability to refer to the concept of transparency and define it "as the extent to which firms are required or expected to justify their decisions and actions for product design, sourcing, production or distribution to stakeholders". They argue that this factor is a pivotal construct for focal firms to help them in deciding which types of approaches they need to choose to manage the sustainability issues in their SCN (the higher accountability, the higher motivation towards a proactive approach to the management of sustainability issues) (Parmigiani, Klassen & Russo 2011). Therefore, transparency can be recognised as a key factor which has a significant effect on the approach that the focal firms choose to implement sustainable development practices (Awaysheh & Klassen 2010; Tachizawa & Wong 2014). Various researchers who address transparency in their work are summarised in Table 3-6, which shows the majority of the definitions focus on the availability of the information.

There are also other factors that determine the pattern of interactions in the SCN structure that can affect the type of approach that firms apply to manage sustainability issues in the SCN. For example, Tachizawa and Wong (2014) identified seven factors that can affect the type of sustainability practices that a firm employs in the SCN. However, aside from power, stakeholder pressure, dependency, and distance, the other three factors (material criticality, industry, and knowledge resources) are not directly related to the pattern of interaction in the SCN structure, and are partly covered by other four factors. For example, being in a more static or dynamic industry can be mediated by stakeholder pressure (Betts, Wiengarten & Tadisina 2015), and material criticality in the form of resource scarcity (Touboulic, Chicksand & Walker 2014). Knowledge resource in the form of expertise and skills can also be considered as one of the power sources (Schneider & Wallenburg 2012). Awaysheh and Klassen (2010) applied three factors (transparency, dependency, and distance) to characterise the structure of the SC to identify the impact of the structure on the use of supplier socially responsibility practices. However, they did not explain the extent the SC actors' power within their business network, which can affect the form of relationship implemented by the focal firm (Kähkönen 2014).

Table 3-6. The impact of transparency on firm's behaviour within SCM

Factor	Definition	Application	Definition source
Transparency	"The extent to which information is readily available to end-users and other actors in the supply chain".	Adoption of socially responsible practices in the suppliers and customers within the supply chain.	(Awaysheh & Klassen 2010, p. 1249)
	"The extent to which firms are required or expected to justify their decisions and actions for product design, sourcing, production or distribution to stakeholders".	Selection of the appropriate actions towards addressing social and environmental issues.	(Parmigiani, Klassen & Russo 2011, p. 215)
	"The extent to which a stakeholder perceives an organization provides learning opportunities about itself".	Adoption of pragmatic strategies for organizational responsible business management.	(Parris et al. 2016, p. 240)
	"Disclosure of information about supplier names, sustainability conditions at suppliers, and buyers' purchasing practices".	Analysing how a firm, in practice, attempts to affect suppliers' sustainability performance.	(Egels-Zandén, Hulthén & Wulff 2015, p. 97)
	"The extent to which all a SCN actor's stakeholders have a shared understanding of and access to the product related information without loss, noise, delay and distortion".	Managing food quality and safety risks.	(Pant, Prakash & Farooquie 2015, p. 385)
		Exploring the status of information systems to support sustainability in food supply chains.	(Wognum et al. 2011, p. 65)

Caridi et al. (2010) suggested virtuality and complexity as being the two main features of the SCN configuration. However, the virtuality, which can be measured by "the amount of supply chain activities that are external to the focal firm" (Caridi et al. 2010, p. 376) can be covered by dependency (Hoejmose, Grosvold & Millington 2013). The complexity, which can be measured by "the number of connections among the nodes" (Caridi et al. 2010, p. 376), can be analysed by firms' power within the business network (Kim et al. 2011). Bellamy, Ghosh and Hora (2014) found two important structural characteristics of the SCN (accessibility and interconnectedness) that may affect the flow of information and knowledge between SCN actors. The SCN accessibility, which can be defined as "how effectively a firm is able to access the different sources of information and knowledge assets in the network", can be analysed by the distance from suppliers (Bellamy, Ghosh & Hora 2014, p. 359). The SCN interconnectedness which can be defined as "how these sources of information and knowledge are structurally inter-linked together in the network" (Bellamy, Ghosh & Hora 2014, p. 359), can be analysed by the transparency of the SCN. The transparency reflects the degree that the information is available in appropriate quantity and quality for all the firm's stakeholders (SCN actors) (Wognum et al. 2011), and can be considered as a "foundational tool" for addressing stakeholder pressure and improving responsible management practices (Parris et al. 2016, p. 223). Thus, to survive in the competitive marketplace, firms need to respond to stakeholder pressure by information processing and increased transparency to positively improve the firms' reputation (Wognum et al. 2011; Gouda & Saranga 2018).

3.5.2 Categorising various sustainability practices

As the interest in sustainable development has increased over the last ten years (Tajbakhsh & Hassini 2015; Blome et al. 2014), firms are realising that incorporating sustainable development objectives into their SCN can improve their economic performance and have numerous benefits through creating new revenue direction and increasing employee and customer satisfaction (Mincer 2008). However, there are a number of views that conceptualise the effort of focal firms in terms of sustainable development objectives, including CSR, sustainable supply network management,

supply chain environmental management, green purchasing strategies, environmental purchasing, green marketing, environmental marketing, environmental marketing management, environmental product differentiation, reverse logistics, sustainability labelling schemes, environmental management, life-cycle assessment, and ISO 14000 certifications (Epstein 2018). These views can be seen in the various contexts such as in commercial sectors, legal frameworks, performance measurements, global supply risks, and public procurement (Shokri, Oglethorpe & Nabhani 2014). In another category, the main practices of SSCM such as collaboration, transparency, and supplier evaluation are only feasible if the focal firms use effective management tools (Beske-Janssen, Johnson & Schaltegger 2015). Based on a comprehensive review of the SSCM and SCN literature, this research (i) evaluates how focal firms approach their SCN actors to manage sustainability issues, (ii) extends the work of Vurro, Russo and Perrini (2009) by emphasising the sustainability practices which large focal firms apply to their SCN, and (iii) categorises the sustainability practices into four distinct RMS, including 'non-compliance', 'transactional', 'dictatorial', and 'collaborative'. Each of RMS is discussed in the following sub-sections.

3.5.2.1 Non-compliance

In a non-compliance RMS, the focal firms typically do not have the intention to make efforts to influence the SCN actors regarding sustainability issues. In other words, this type of RMS fails to address the demands for sustainability requirements from stakeholders, and the focal firms do not pay attention to the sustainability issues in their relationships with the SCN actors (Lee & Ball 2003; Meinlschmidt, Schleper & Foerstl 2018; Wilhelm et al. 2016b). The practices in this strategy may best apply to the less complex SCN or the firms that are not too visible by the end-user (Caridi et al. 2010; Parmigiani, Klassen & Russo 2011; Wilhelm et al. 2016b). The focal firms that are under less pressure from various institutions have the tendency to be followers and be looking for a conservative approach such as implementing successful practices after they are validated by pioneer firms (Simpson, Power & Samson 2007). The tendency towards this mechanism may also come from the situation that the sustainability performance of suppliers may not affect the focal firms' performance

(Tachizawa & Wong 2014). In other words, they may not be key actors in the focal firms' SCN. Thus, the sustainability practices implemented by focal firms do not seem valued by focal firms.

In addition, the focal firms in this strategy often have limited power when compared to other actors in the SCN (Esty & Winston 2009). They do not usually have sufficient financial or technical resources to urge their SCN actors to make them more sustainable (Delmas & Montiel 2009). Furthermore, this strategy may be useful when the information exchange with SCN actors is more costly, ineffective, and uneconomical (Simpson, Power & Samson 2007; Vurro, Russo & Perrini 2009; Wilhelm et al. 2016b). However, ignoring sustainability issues in this type of relationship may have dire consequences such as losing support from influential NGOs (like the World Wide Fund and Rainforest Alliances) which has the potential to damage the focal firm's reputation (Kumar et al. 2017; Vurro, Russo & Perrini 2009). In contrast, involving numerous SCN actors with sustainability practices can add more complexity to the SCN, which makes it more difficult for the focal firms to control these practices (Sarkis, Zhu & Lai 2011), potentially providing further benefits to focal firms (Kim et al. 2011).

Tachizawa and Wong (2014) used a 'don't bother' approach to categorise the sustainability practices, which are used by the focal firms to address sustainability issues in the low tier suppliers. They identified that the focal firms usually do not have information about sustainability issues with those actors and often focus on just their first-tier suppliers (Tachizawa & Wong 2014). This type of practice can be seen in the work of various researchers (see Esty & Winston 2009; Gonzalez, Sarkis & Adenso-Diaz 2008; Mena, Humphries & Choi 2013; Meinlschmidt, Schleper & Foerstl 2018; Schneider & Wallenburg 2012; Tachizawa & Wong 2014; Wilhelm et al. 2016b).

3.5.2.2 Transactional

In a transactional RMS, the focal firms pay more attention towards pursuing sustainability issues. However, by adhering to the minimum standards and requirements compliant with regulations, the focal firms often seek only a minimum

level of sustainability commitment (Lee & Ball 2003). In other words, by employing arms-length interactions (such as environmental monitoring) with the various actors in the SCN, the focal firms seek short-term commitments and a low level of information sharing (Gascoigne 2002; Krut & Karasin 1999; Vurro, Russo & Perrini 2009). This may happen when the focal firms identify that these actors are not key players in their business environment or the focal firms have not sufficient power to influence those actors. For example, MacCarthy and Jayarathne (2012) indicated how successfully a supermarket retailer (a focal firm) used arm's length interactions (such as limited concern for monitoring the well-being of employees) to manage sustainability issues in their SCN.

This type of relationship management strategy indicates the focal firms tend to merely satisfy the necessary requirement of the sustainability concept and have no intention of employing sustainability initiatives to go beyond the national standards and legislation (MacCarthy & Jayarathne 2012). In the case of environmental sustainability, environmental monitoring practices often concentrate on the outcomes of environmental initiatives (Paulraj & Blome 2017), such as having certifications such as receiving ISO 14001 or environmental dimension: eco-management and audit scheme (EMAS), or being compatible with a specific legislation such as hazardous materials labeling and greenhouse gas emissions, or preparing the environment-related documentation (Vachon & Klassen 2006). To employ sustainability practices in a transactional strategy, the focal firms usually gather and process the SCN actors' information via publicly disclosed documentation or auditing by another actor (Min & Galle 2001; Meinlschmidt, Schleper & Foerstl 2018; Wilhelm et al. 2016b). For example, the focal firm can collaborate with NGOs to use their databases for monitoring its lower tier suppliers (Miemczyk, Johnsen & Macquet 2012).

In addition, Tachizawa and Wong (2014) argue that focal firms apply power over their first-tier suppliers to monitor sustainability issues in their lower tier suppliers as it is difficult to control sustainability compliance across the entire SCN by themselves. They push first-tier suppliers to ask for the environmental and social certification from their lower tier suppliers (Tachizawa & Wong 2014). They need requirements such as

codes of conduct and lists of hazardous materials (Delmas & Montiel 2009; Koh, Gunasekaran & Tseng 2012; Simpson, Power & Samson 2007), and sustainability standards such as ISO 14000 and SA 8000 (Castka & Balzarova 2008; Esty & Winston 2009; Gonzalez, Sarkis & Adenso-Diaz 2008; Mena, Humphries & Choi 2013). Firms, particularly SMEs, can effectively spread the sustainability requirements pushed by large firms to their own suppliers (Ayuso, Roca & Colomé 2013). The focal firms may ask their first-tier suppliers to improve the sustainability performance of their second-tier suppliers (Ablander, Roloff & Nayır 2016). Therefore, in this strategy, focal firms do not tend to put a high level of energy and time into the management of sustainability issues of their SCN actors.

3.5.2.3 Dictatorial

"A dictatorial solution is one in which the will of one individual always prevails" (Heal 1998, p. 8). The practices in this RMS often emerge when the focal firm has more power than its SCN actors, and because of its dominance, the focal firm can force the other actors to follow its edicts (Drucker & Noel 1986), and use their own resources to audit sustainability standards on a regular basis (Meinlschmidt, Schleper & Foerstl 2018). The focal firms apply more proactive approaches as they become aware of the potential benefits that can be achieved through commitments to the sustainability principle (Lee & Ball 2003). Parmigiani, Klassen and Russo (2011) provide an example, which explains that banning cellular phone use while driving in five countries and 30 U.S States, exerts a mounting pressure on the manufacturers to adopt a technology which disables use while driving. Based on the other local regulation and the level of public scrutiny, the focal firms are faced with less pressure related to the changing of product design. However, Nokia and other large cellular phone manufacturers put this regulation into practices that forces their suppliers to follow the new regulations in every location. This means that these focal firms may not be accountable for new regulations in each geographic area, but they consider it may happen in the near future.

In the dictatorial RMS, the focal firms usually impose some norms, standards and practices (either created by themselves or that come from regulations) to manage

sustainability issues throughout the SCN (Ormazabal & Puga-Leal 2016) and establish a set of procedures to implement them (Andersen & Skjoett-Larsen 2009). For example, Nike developed its own workforce and environmental standards to monitor the social and environmental issues of its suppliers (Awaysheh & Klassen 2010) or in another case, IKEA instituted its own CSR certificate to ensure that sustainability requirements were followed by its suppliers (Andersen & Skjoett-Larsen 2009). Harms, Hansen and Schaltegger (2013) categorise examples of such norms and standards into three dimensions of sustainability:

- Economic dimension: organisation for economic co-operation and development (OECD) guidelines or the quality aspect, such as ISO 9000
- EMAS and DIN ISO 14001.
- Social dimension: conventions of the international labour organization (ILO) and the UN global compact

In other words, since the SCN actors cannot exert influence over the focal firms, the latter adopt the role of commander, setting the rules of sustainability issues for the SCN actors and urging them to follow the rules (Vurro, Russo & Perrini 2009). By having the ability to make decisions independently through exerting economic and non-economic influences (Parmigiani, Klassen & Russo 2011), the focal firms can create pressure on their customers as well as suppliers (Dubey et al. 2017). For example, as part of the supplier relationship management process, the focal firms can apply incentives (Andersen & Skjoett-Larsen 2009) or sanctions for supplier evaluation results (Peters 2010). In the most extreme case, the negative outcome can be accompanied by the termination of the business relationship (Delmas & Montiel 2009; Pedersen & Andersen 2006; Pullman et al. 2017), although, collaborating in sustainability practices rather than sanctions may result in improved sustainability performance (Ablander, Roloff & Nayır 2016). Accordingly, this strategy is concerned with dictating instructions to the SCN actors to achieve desired outcomes.

Businesses are replete with examples of focal firms that use their power to force their SCN actors to adopt top-down standards, particularly, when big firms make efforts to employ the environmental and social standards across the suppliers and the

manufacturers in the developing countries (Roberts et al. 2006; Roberts 2003). For example, Nestle employs the more formal and structured strategies to manage sustainability issues across its SCN. It defines the key performance indicators (KPIs) which are based on three quantitative and nine qualitative criteria and also specify clear objectives and responsibilities for the actors which tend to join Nestlé's sustainable program (Alvarez, Pilbeam & Wilding 2010).

3.5.2.4 Collaborative

The practices of a collaborative RMS are those that include both focal firms and others in the SCN directly implementing agreed upon approaches and are typically concerned with mutual sustainability outcomes for both involved parties. Collaboration in SCM has a significant role in improving competitive advantage (Chen et al. 2017; Gold, Seuring & Beske 2010) and can increasingly reduce the uncertainty and the overall cost (Carter & Rogers 2008). As defined by Simatupang and Sridharan (2002, p. 19), SC collaboration is "two or more chain members working together to create a competitive advantage through sharing information, making joint decisions and sharing benefits which result from the greater profitability of satisfying end customer needs than acting alone". In support, Simatupang and Sridharan (2005, p. 258) define collaboration as "the close cooperation among autonomous business partners or units engaging in joint efforts to effectively meet end customer needs with lower costs". Also, in long-term oriented relationships, having a high level of information sharing, trust and commitment are the core aspects of the collaborative approach (Soosay & Hyland 2015).

Within sustainability, collaboration is seen as a cornerstone to improving sustainability performance (Paulraj & Blome 2017; Sarkis, Zhu & Lai 2011; Soosay & Hyland 2015). In this regard, an increasing number of researchers have worked in the area of the collaborative approach in SSCM (Beske & Seuring 2014; Soosay & Hyland 2015; Tachizawa & Wong 2014). In the collaborative RMS, the focal firms and the SCN actors adopt collaborative relationships based on the cooperation and joint activities which can be beneficial for each participant (Ablander, Roloff & Nayır 2016). The focal firms develop the collaborative relationships with multi-stakeholders

in terms of various joint rules (such as knowledge sharing, enhancing competencies and capabilities, gaining certifications and implementing environmental management systems) to make their SCN more sustainable (Vurro, Russo & Perrini 2009).

By entering into a close partnership with the key SCN actors (both business and non-business actors), the focal firms can add more sustainability legitimacy to its reputation (Crespin-Mazet & Dontenwill 2012; Wilhelm et al. 2016b). For example, the focal firm may create a collaborative relationship with a lower tier supplier by providing training on how to adopt cleaner production methods and, at the same time, work closely with a NGO to generate a specific environmental standard (Tachizawa & Wong 2014; Wilhelm et al. 2016b). Crespin-Mazet and Dontenwill (2012) conduct a case study and explained how the focal firm signed an agreement to buy materials at a certain volume and price from its suppliers to encourage cultivating plants in compressed clods. The focal firm can also develop a partnering relationship with non-business actors such as militant organisations to create a corporate legitimacy (Crespin-Mazet & Dontenwill 2012). Therefore, focal firms that apply this strategy spend many resources to manage sustainability in their SCN.

There are various sustainability practices which can be implemented through collaborative relationships. For example, MacCarthy and Jayarathne (2012) present the collaborative approach which was applied by a leading brand retailer, to make its SCN more sustainable. The focal firm has attempted to jointly develop solutions with its suppliers in terms of sustainability issues. The focal firm goes beyond the minimum requirements and sets global benchmarks. This includes being directly involved in various projects, both in the social dimension such as the well-being of employees and local community and the environmental dimension such as the use of energy and use of toxic chemicals within the production lines of its suppliers (MacCarthy & Jayarathne 2012).

In other empirical research, Sharfman, Shaft and Anex (2009) identify three best practices in the collaborative relationships between the focal firms and their suppliers. A ‘cooperative strategy’ is mainly about the focal firms and their top-management

attitude towards their SCN in a partnership manner rather than in the more conventional way, as a set of competitive interactions. 'Cooperation with the regulator' is concerned with building closer relationships, for example, with regulators, which can enhance the focal firms' ability to be more creative with their suppliers. 'Carrots and sticks' refer to the situations that the focal firms, besides setting the rigid standards, need to also provide education and training assistance to their suppliers to help them achieve the expected sustainability results (Sharfman, Shaft & Anex 2009). They find that using these types of practices in collaborative relationships can increase sales, and lead to more satisfied customers and reduce costs (Sharfman, Shaft & Anex 2009).

Other examples of the collaborative approach are highlighted in joint product design and development (Burgess, Singh & Koroglu 2006; Sarkis, Zhu & Lai 2011), risk management on the frequency of supply chain disruptions (Revilla & Saenz 2017), green supply chains (Chin, Tat & Sulaiman 2015) and being involved directly with the suppliers and the customers to forecast and plan demand and supply (Skjoett-Larsen, Thernøe & Andresen 2003). More importantly, knowledge and information about ingredients, components and workplace conditions in all the actors of the SCN are essential in making the product green or sustainable (Beske & Seuring 2014). To manage the flow of this information from the suppliers to the end-customers, creating cross-functional teams are the useful practices to enhance communication and joint development (Chen & Paulraj 2004; Guesalaga et al. 2018; Vachon & Klassen 2006). However, it is difficult to build trust and increase the quality of information sharing by such practices since these difficulties have been recognised as a barrier to improve sustainability in SCM (Hassini, Surti & Searcy 2012).

The focal firms may also use one or more of the four approaches in their SCN simultaneously. The distinctions between four types of RMS are explained in Table 3-7. For example, a focal firm may: (1) keep the existing relationship, regardless of sustainability improvement within it (non-compliance), (2) seek the minimum requirement of social and environmental standards in lower tier suppliers with the help of third parties (transactional), (3) force suppliers to implement environmental

management systems (dictatorial), (4) extend the business volume with some existing suppliers who already meeting sustainability requirements (dictatorial, collaborative), and (5) develop close partnerships with NGOs, activists and militant organisations (collaborative) (Crespin-Mazet & Dontenwill 2012). This means that the focal firms may develop and maintain different types of relationships (through various business practices) with both upstream and downstream actors that form their own network environment to achieve competitive advantage (Chang, Chiang & Pai 2012; Meinlschmidt, Schleper & Foerstl 2018). They can cover a range of activities from simple business interactions and transaction exchanges to close partnerships with suppliers and NGOs (Crespin-Mazet & Dontenwill 2012). However, these studies relate to the various relationships in employing the sustainability practices and have not clarified how a focal firm can choose which particular types of relationships are effective in the specific SCN structure (Miemczyk, Johnsen & Macquet 2012; Parmigiani, Klassen & Russo 2011; Touboulic & Walker 2015).

In summary, several SSCM frameworks have been introduced over the past ten years to help focal firms to choose the appropriate types of RMS through various governance mechanisms and a set of sustainability practices in the SCN (Awaysheh & Klassen 2010; Crespin-Mazet & Dontenwill 2012; Harms, Hansen & Schaltegger 2013; Kumar et al. 2017; Meinlschmidt, Schleper & Foerstl 2018; Parmigiani, Klassen & Russo 2011; Tachizawa & Wong 2014; Vachon & Klassen 2006; Vurro, Russo & Perrini 2009). All these researchers see the SCN structure as a key factor in the effective implementation of sustainability practices in the SCN. However, they have not clearly explained how the SCN structure can play a role in improving sustainability in the SCN. In support, various research suggests more investigation of the SCN structure role in the RMS within the SCN and consider it as a promising direction for research (Alvarez, Pilbeam & Wilding 2010; Fabbe-Costes, Roussat & Colin 2011; Tachizawa & Wong 2014; Vachon & Klassen 2006; Wilhelm et al. 2016b; Winter & Knemeyer 2013). In the next section, a conceptual framework is developed to potentially fill the gap that focuses on deciding appropriate types of RMS to implement sustainability practices.

Table 3-7. Four types of RMS

RMS	Reference	Objective	Type of link	Examples of Practice
Non-compliance	(Lee & Ball 2003; Mena, Humphries & Choi 2013; Meinlschmidt, Schleper & Foerstl 2018; Parmigiani, Klassen & Russo 2011; Tachizawa & Wong 2014; Vurro, Russo & Perrini 2009)	No intention towards making effort to address sustainability issues with the SCN actors	Indirect	• "No information about lower tier suppliers" (Tachizawa & Wong 2014, p. 652).

Table 3-7. Four types of RMS (continued)

RMS	Reference	Objective	Type of link	Examples of Practice
Transactional	(Beske & Seuring 2014; Harms, Hansen & Schaltegger 2013; Lee & Ball 2003; MacCarthy & Jayarathne 2012; Tachizawa & Wong 2014; Vachon & Klassen 2006; Vurro, Russo & Perrini 2009; Wilhelm et al. 2016b)	Merely seek to satisfy the minimum requirements and standards of the sustainability concept within the SCN actors	Indirect	• "Requiring that suppliers have an environmental management system (such as ISO 14000)" (Vachon & Klassen 2006, p. 819). • "Encouraging first-tier suppliers to source from second-tier suppliers who apply sustainability programmes that aim to reduce the use of toxic chemicals" (MacCarthy & Jayarathne 2012, p. 261). • "Gathering and processing the SCN actors' information via publicly disclosed documentation" (Wilhelm et al. 2016b, p. 203). • "Fulfilling only the minimum requirements of the workforce rights in terms of remuneration and working conditions" (MacCarthy & Jayarathne 2012, p. 263). • "Auditing suppliers by external service providers" (Harms, Hansen & Schaltegger 2013, p. 212; Meinlschmidt, Schleper & Foerstl 2018, p. 14). • "External supplier evaluation" (Harms, Hansen & Schaltegger 2013, p. 212). • "Environmental monitoring practices" (Paulraj & Blome 2017, p. 1019) • "Delegating responsibilities to third parties such as standards institutions, auditors" (Tachizawa & Wong 2014, p. 652). • "Requiring that lower tier suppliers be certified (such as ISO 14000, SA 8000)" (Tachizawa & Wong 2014, p. 652).

Table 3-7. Four types of RMS (continued)

RMS	Reference	Objective	Type of link	Examples of Practice
Dictatorial	(Alvarez, Pilbeam & Wilding 2010; Andersen & Skjoett-Larsen 2009; Delmas & Montiel 2009; Harms, Hansen & Schaltegger 2013; Min & Zhou 2002; Pullman et al. 2017)	Exert a mounting pressure on the SCN actors to follow its own term, condition, and standards in the sustainability concept	Direct	• "Audit of the firm's existing product offer and new suppliers" (Crespin-Mazet & Dontenwill 2012, p. 211) • "Regular auditing of suppliers' performance" (Andersen & Skjoett-Larsen 2009, p. 82) • "Termination of the supplier relationship" (Harms, Hansen & Schaltegger 2013, p. 213; Pullman et al. 2017, p. 173) • "Auditing sustainability standards on a regular basis" (Meinlschmidt, Schleper & Foerstl 2018, p. 29) • "Defining KPIs for the actors which tend to make a relationship" (Alvarez, Pilbeam & Wilding 2010, p. 176) • "Urging suppliers to follow product safety issues, such as using materials which are normally not required by the regulations" (Parmigiani, Klassen & Russo 2011, p. 216) • "Directed sourcing; select directly lower tier suppliers or use a list of preferred lower tier suppliers" (Tachizawa & Wong 2014, p. 652) • "Mandating suppliers to attach radio frequency identification (RFID) tags to their products" (Drake & Schlachter 2008, p. 857) • "Asking the partners, irrespective of their constraints, to use advanced IT-tools (such as electronic data interchange (EDI)) for the automation of the supply chain" (Jharkharia & Shankar 2006, p. 346) • "Positive incentives for suppliers in terms of long-term contracts and enlarged volume if they implement codes of conduct" (Andersen & Skjoett-Larsen 2009, p. 82)

Table 3-7. Four types of RMS (continued)

RMS	Reference	Objective	Type of link	Examples of Practice
Collaborative	(Drake & Schlachter 2008; MacCarthy & Jayarathne 2012; Meinlschmidt, Schleper & Foerstl 2018; Parmigiani, Klassen & Russo 2011; Rota, Reynolds & Zanasi 2013; Sharfman, Shaft & Anex 2009; Tachizawa & Wong 2014; Vachon & Klassen 2006; Vurro, Russo & Perrini 2009)	Adopt the close relationships based on the share resources and joint problem-solving activities with SCN actors to manage sustainability issues	Direct	• "Collaborate in the design of new products or new product lines" (Vachon & Klassen 2006, p. 820). • "Having a high level of information sharing" (Soosay & Hyland 2015, p. 615) • "Defining standards with non-business actors" (Crespin-Mazet & Dontenwill 2012, p. 211). • "Collaborating to educate students, teachers, community workers and the general public on water conservation and management" (MacCarthy & Jayarathne 2012, p. 260). • "Training of suppliers for improving social and environmental conditions" (Harms, Hansen & Schaltegger 2013, p. 213). • "Provide assistance to first-tier suppliers on how to monitor and/or collaborate with lower tier suppliers" (Tachizawa & Wong 2014, p. 652). • "Training of key personnel at the supplier level"(Andersen & Skjoett-Larsen 2009, p. 82, Paulraj & Blome 2017, p. 1014).

3.6 Towards a conceptual framework for SSCN

A conceptual framework has been designed (Figure 3-1) to fully exploit the potential of the existing pattern of interactions among SCN actors in order to make a focal firm's SCN more sustainable. This model suggests that focal firms can reach their sustainability outcomes by incorporating sustainability practices into its SCN based on the various types of RMS. In addition, considering the SCN structure as being a critical factor for the process of implementing sustainability practices can help focal firms identify effective RMS to improve sustainability in their SCN.

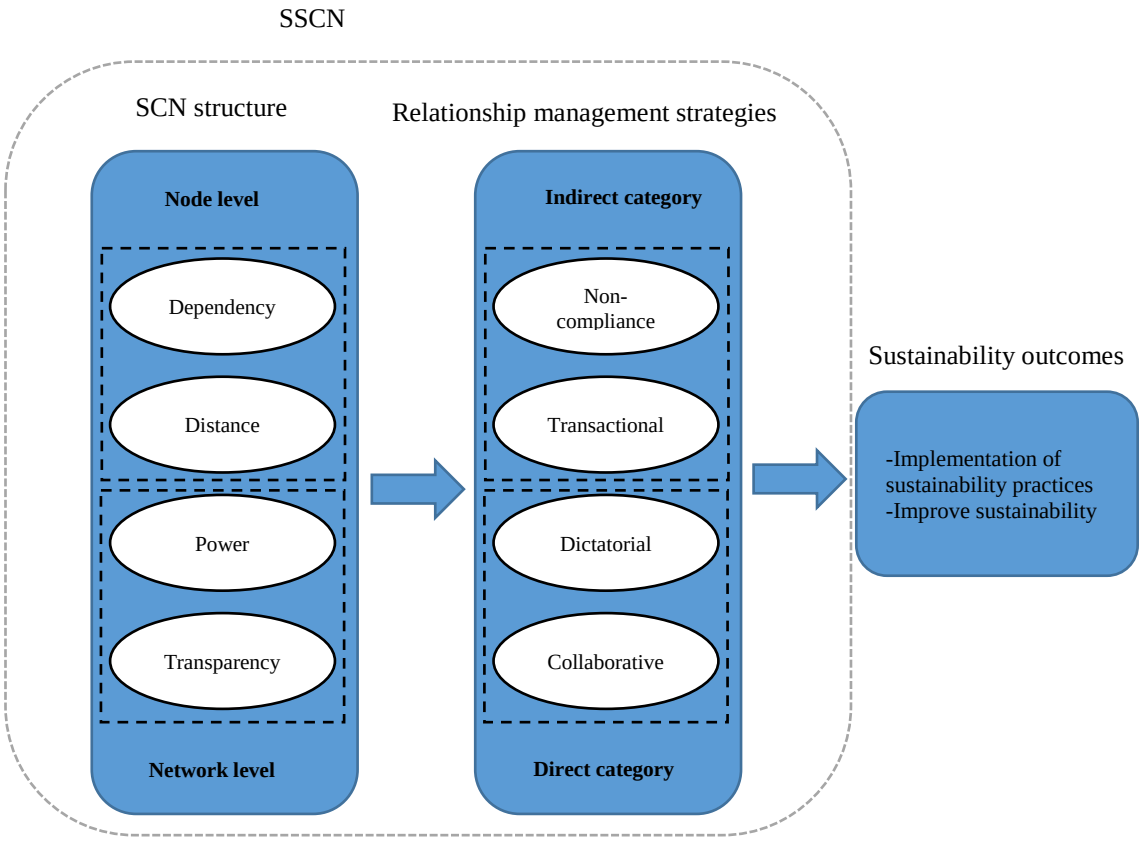

Figure 3-1. Conceptual framework

As seen in Figure 3-1, to ensure the implementation of sustainability practices and improvement of sustainability in the SCN, the focal firm must choose one or more RMS which consequently provide the main framework to select the specific types of sustainability practices. These RMS are divided into two categories. The indirect category which includes non-compliance and transactional RMS are applied when the focal firm uses another resource (such as third parties, NGOs) to manage sustainability issues in its SCN actors. In contrast, in the direct category which includes dictatorial and collaborative RMS, the focal firm uses its own resources and is directly involved in the process of managing sustainability issues with its SCN actors. In this process, the focal firm must consider the impact of the SCN structure on the RMS, as the various pattern of interactions among the actors in the SCN can provide different conditions for the focal firm to choose RMS. This implies that based on the combination of analysis at the node level (which can be examined by dependency and distance) and at the network level (which can be examined by power and transparency) for each actor in the SCN structure, the focal firm can identify which types of RMS

are appropriate for the SCN actor. For example, to make the SCN more sustainable, a retailer may begin with the analysis of the pattern of interactions among the various actors in the SCN. By interpreting each SCN actor's position based on how much the actor is dependent on the retailer, has distance to the retailer, has the power, and is transparent to the whole network, the retailer can identify which actor has to be selected, for example, a collaborative approach. Accordingly, the retailer may add some standards of workplace conditions in their supplier relationship management process to force small suppliers to implement sustainability practice. The same analysis needs to be conducted when the retailer wants to collaborate with the key suppliers to jointly run mutual projects, such as a new product development process, marketing, or manufacturing activities that use recyclable materials. In this regard, the focal firm can save time and money by assigning the appropriate type of RMS to each SCN actor to manage the sustainability issues across the SCN.

An important element of analysing the relationships in the SCN is understanding the configuration of the SCN structure (Kim et al., 2011). The SCN structure indicates how various firms are configured with their linkages to each other to provide value (Lambert, 2008), including various types and magnitudes of relationships among actors (Winter and Knemeyer, 2013). Such a deep understanding of the SCN structure is crucial for focal firms because the formation of linkages between different actors in the SCN can affect its behaviours, strategies (Borgatti and Li, 2009), and the implementation of the SCM practices (Winter and Knemeyer, 2013).

Applying a network perspective to the SCM context provides the highest degree of complexity, which demands new targets such as network structures (Fabbe-Costes et al., 2011). For example, adding suppliers to a SCN can increase its complexity by affecting the material and information flows among SCN actors (Bozarth et al., 2009). Using a network perspective can shape the structure of the SCN as a constant exchange of valuable resources among various actors, which can be viewed as a pattern of interactions among different actors (Roscoe et al., 2016).The discussion above reveals that focal firms' choices of RMS are highly dependent on the characteristics of its SCN structure, including dependency, distance, power, and transparency. Each of four

factors, which have been identified to conceptualise the SCN structure can affect the types of relationships employed by focal firms to manage sustainability issues within their SCN. To summarise:

Dependency is used to analyse the level of influence at the node level of a SCN. It measures the extent to which a SCN actor relies on another SCN actor in a dyadic relationship (Hoejmose and Adrien-Kirby, 2012). Dependency can be categorised into supplier dependency and buyer dependency. The former measures how much a supplier is dependent on buyers, while the latter measures how much a buyer is dependent on suppliers (Touboulic et al., 2014). Dependency plays a significant role in a focal firm's behaviour (Hoejmose et al., 2013) and is considered a significant factor in the SSCM context by many authors (Pedersen and Andersen, 2006; Tachizawa and Wong, 2014; Wilhelm et al., 2016b). For example, as focal firms' dependency on buyers increases, they have a higher tendency to adopt socially responsible practices (Awaysheh and Klassen, 2010).

Distance is used to analyse the level of information available at the node level since the length of the path between two SCN actors can significantly affect the exchange of information between them (Bellamy et al., 2014). Three categories can be used to measure the distance between SCN actors (Awaysheh and Klassen, 2010). They are physical distance which is concerned with difficulties in making communication (Cummings and Teng, 2003), organisational distance which is related to difficulties in mutual interactions (Parjanen, et al., 2010), and cultural distance which relates to differences in the language, norms, and values (Busse et al., 2016; Lee and Herold, 2016). The impact of distance on managing sustainability practices between two firms has also been addressed by several studies (Awaysheh and Klassen, 2010; Busse et al., 2016; Grimm et al., 2014; Hoejmose et al., 2013; Wilhelm et al., 2016b). For example, as distance increases, rich exchanges of information between firms would be difficult, which may lead to a more complex environment for firms' coordination and collaboration (Parmigiani et al., 2011).

At the network level, power means the ability of a firm to influence other firms within its network (Pilbeam et al., 2012). Firms gain power through various resources. By believing a source (e.g. customers) knowledge and skill (expert power), reputation and image (referent power), and legitimacy of authority (legitimate power); the targets (e.g. suppliers) determine whether and how much the sources can influence them. In contrast, by creating positive opportunities (such as placing purchase orders) in reward power and creating negative opportunities (such as cancelling purchase orders) in coercive power, the sources will decide when and how they can influence their targets (Zhao et al., 2008). Unlike the dependency confined to the dyadic relationship, power resides within the network in which a firm is embedded (Meqdadi et al., 2016). Having power over other SCN actors affects the implementation of sustainability practices by determining the depth of collaboration between the focal firms and other SCN actors (Kähkönen, 2014). As power is important in the adoption of sustainability practices (Alvarez et al., 2010; Andersen and Skjoett-Larsen, 2009; Hartmann and Vachon, 2018; Meqdadi et al., 2016; Mena et al., 2013; Parmigiani et al., 2011; Wilhelm et al., 2016a), it has been used to analyse the level of influence in the SCN structure

The level of information availability at a network level is analysed through transparency, which can refer to the extent of the information about a SCN actor available to other SCN actors (Awaysheh and Klassen, 2010). Firms with largely visible brands may be subject to greater scrutiny by various stakeholders such as the public, the media and NGO (Bradley and Botchway, 2018; Wu et al., 2017). Analysing transparency within the SCN structure can assist focal firms to decide how to manage sustainability issues with their SCN actors (Parmigiani et al., 2011). For example, Meinlschmidt et al. (2018) found that a report by an NGO regarding child labour in Asian lower tier suppliers could change the focal firms' policy towards ongoing supplier development programs. In this regard, many studies have found that transparency is a significant factor affecting focal firms' decision on choosing sustainability practices (Awaysheh and Klassen, 2010; Egels-Zandén et al., 2015; Parmigiani et al., 2011; Wilhelm et al., 2016b).

The discussion above suggests that focal firms' choices of RMS are highly dependent on the characteristics of its SCN structure. In deciding on an appropriate type of RMS, i.e. non-compliance, transactional, dictatorial, collaborative; a focal firm needs to consider the combination of factors affecting its SCN structure, i.e. dependency, distance, power and transparency. Table 3-8 highlights various authors who have identified the potential relationship among the related factors and RMS. However, there is still the need for more empirical research to be undertaken (Meinlschmidt et al., 2018; Wilhelm et al., 2016b). Thus, this study intends to analyse the relationship by testing the following four hypotheses. These hypotheses will be tested through the empirical study in Chapters Five and Six.

Hypothesis 1: Dependency, distance, power and transparency influence focal firms' choice of non-compliance RMS to manage sustainability in the SCN.

Hypothesis 2: Dependency, distance, power and transparency influence focal firms' choice of transactional RMS to manage sustainability in the SCN.

Hypothesis 3: Dependency, distance, power and transparency influence focal firms' choice of dictatorial RMS to manage sustainability in the SCN.

Hypothesis 4: Dependency, distance, power and transparency influence focal firms' choice of collaborative RMS to manage sustainability in the SCN.

3.7 Summary

This chapter mainly discussed how focal firms incorporate sustainability into their SCN. It began with the motivation for the focal firms to move towards sustainability in SCM. Then, as discussed in Chapter Two, the importance of having network perspective in SSCM and creating the appropriate RMS to access the valuable resources required for the sustainable development goals was reviewed. Accordingly, various types of sustainability practices, which have applied by many researchers, was recognised and categorised into four RMS (non-compliance, transactional, dictatorial, and collaborative). Then, to explain how the focal firms can identify which types of

RMS are effective, this chapter emphasised the role of the SCN structure which consists of the pattern of interrelated actors in the focal firms' SCN.

Table 3-8. The potential connection between the SCN structure and RMS

RMS	SCN structure	References
Non-compliance	Dependency	(Wilhelm et al., 2016b; Scheer et al., 2015)
	Distance	(Tachizawa and Wong, 2014; Klassen and Vachon, 2003; Wuyts and Geyskens, 2005)
	Power	(Meinlschmidt et al., 2018; Bandara et al., 2017, Alvarez et al., 2010)
	Transparency	(Awaysheh and Klassen, 2010, Parmigianiet al., 2011)
Transactional	Dependency	(Awaysheh and Klassen, 2010; Jorge and Jerónimo, 2017)
	Distance	(Awaysheh and Klassen, 2010; Klassen and Vachon, 2003)
	Power	(MacCarthy and Jayarathne, 2012)
	Transparency	(Awaysheh and Klassen, 2010; Parmigiani et al., 2011; Wilhelm et al., 2016b)
Dictatorial	Dependency	(Connellyet al., 2011; Gilliland et al., 2010)
	Distance	(Meinlschmidt et al., 2018; Wilhelm et al., 2016b)
	Power	(Andersen and Skjoett-Larsen, 2009; Ciliberti et al., 2009; Hoejmose et al., 2013; Neville and Menguc, 2006; Peters, 2010)
	Transparency	(Parmigiani et al., 2011)
Collaborative	Dependency	(Awaysheh and Klassen, 2010; Jorge and Jerónimo, 2017)
	Distance	(Awaysheh and Klassen, 2010; Hoejmose et al., 2013; Klassen and Vachon, 2003; Parmigiani et al., 2011)
	Power	(MacCarthy and Jayarathne, 2012; Parmigiani et al., 2011)
	Transparency	(Awaysheh and Klassen, 2010; Grimm et al., 2016; Wilhelm et al., 2016b)

To analyse the SCN structure more precisely, four sub-factors were identified (transparency, dependency, distance, and power) which help focal firms to conceptualise the SCN structure. Finally, in the last section, this chapter provided a conceptual framework to support focal firms to incorporate sustainability into their SCN. By presenting the conceptual framework, this research argued that to create a more sustainable SCN, focal firms need to develop and maintain different types of RMS. More importantly, the conceptual framework highlighted that focal firms need to consider the impact of the SCN structure on the RMS to make improvement in the sustainable development objectives in their SCN. This means that the focal firm can use this model to decide which appropriate sustainability practices have to be employed in which business processes.

By discussing the importance of the network relationship concept for firms to access valuable resources in the SCN in Chapter Two and highlighting the role of SSCM for the business to survive in the fierce worldwide competition in Chapter Three, this research has suggested a conceptual framework. The framework argues that focal firms need to examine their SCN structure, as it can affect the RMS required to incorporate sustainability into their SCN. As a result, four hypotheses were developed. To validate the conceptual framework and test the hypotheses, this framework will be empirically tested to identify how the various elements of the framework might integrate. The next chapter explains the proposed methodology to identify how the focal firms can analyse the impact of SCN structure on their choice of RMS.

CHAPTER 4 RESEARCH METHODOLOGY

4.1 Introduction

In the previous chapters, SCN and the sustainability literature were reviewed. As a result, a conceptual framework was developed, suggesting how the SCN structure can affect the types of RMS that focal firms apply to improve sustainability in their SCN. This chapter explains the research methodology to address this issue. By choosing the Australian food and grocery industry, this research aims to test and verify the conceptual framework in the complex SCN with powerful focal firms. To do so, this chapter discusses various research philosophies, approaches, strategies, and choices and determines the appropriate types to investigate the problem within the unit of analysis. Then, the data collection method is presented, which includes sampling techniques, pretesting and survey administration procedures. To analyse the collected data, a data analysis technique will be proposed, and the related error management system will be explained.

4.2 Research philosophy

The first step in the research methodology is to determine the research philosophy (Saunders 2011). A research philosophy refers to the way of gathering, analysing and using data about a phenomenon (Dubey, Gunasekaran & Chakrabarty 2017). The research philosophy determines important assumptions which support the research strategy and the methods of conducting the research project (Saunders 2011). There are two major philosophical dimensions in the existing research paradigms called 'ontology' and 'epistemology' (Wahyuni 2012). Ontology concerns with the nature of knowledge and emphasises how reality can be perceived (Iofrida et al. 2014). The reality in this dimension can be interpreted as the objective or the product of an individual's comprehension (Saunders 2011). Epistemology relates to the development of that knowledge which in the ontology is considered real (Wahyuni 2012). This dimension is concerned with the philosophical basis of knowledge and views how one develops knowledge of the social context (Antwi & Hamza 2015). The main distinction between these two dimensions is that the ontology is related to the

question of “what can we know?”. Epistemology is concerned with the question of “how can we know?” (Wright et al. 2016, p. 97).

There are two main research philosophies to conduct research projects: positivism and interpretivism/constructionism, which are also referred to as post-positivist or anti-positivist (Henderson 2011; Iofrida et al. 2014). Positivism uses the viewpoint of natural science in investigating the social science (Saunders 2011). The reality in the positivist philosophy can be objectively investigated through quantitative measures (Tibane & Niemand 2017). This type of philosophy examines the phenomenon by testing a theory in the form of hypotheses and applying statistical tools to achieve the desired outcomes (Wahyuni 2012). Positivists believe that through a similar research methodology and in applying statistical analysis tests, different researchers can achieve similar outcomes in investigating the same factual problem (Creswell & Creswell 2017). In the interpretivist philosophy, the reality is believed to be constructed based on social actors and individuals’ perceptions of it (Wahyuni 2012). Interpretivism is concerned with a qualitative way of conducting research through an in-depth investigation of small sampling size as opposed to positivism that is associated with quantitative research and data collection methods (Saunders 2011). The key tenet of interpretivism philosophy is that knowledge can be created through questioning the reasons of the event and how it happens instead of describing the events in a positivist philosophy (Tibane & Niemand 2017). The positivist philosophy means knowledge can be developed by measuring objects, indicating the quantitative relationships between constructs (Wright et al. 2016). In contrast, the interpretivist philosophy explains that knowledge can be produced through exploring the phenomenon in its context, which is often achieved through observations (Wright et al. 2016). This research investigates a complex SCN and analyses the relationship between the SCN structure and the RMS by testing hypotheses and quantifying the constructs and relationships between them (provided in the Chapter Three), therefore prominently reflecting the ontological dimension of positivism in the research approach.

4.3 Research approaches

The approach that researchers apply to their research projects raises important questions in designing the research (Saunders 2011). There are two major approaches for conducting a research: deductive and inductive (Antwi & Hamza 2015; Woiceshyn & Daellenbach 2018). In the deductive approach, the researcher extracts a hypothesis from the theory and verifies it empirically (Bryman & Bell 2015). The hypothesis (which is a proposition that demonstrates the relationship between two or more variables) will be tested in this type of research and eventually will be confirmed or rejected (Bell, Bryman & Harley 2018). It could also lead to the revision of the theory in light of the findings (Saunders 2011). In contrast, the inductive approach uses research findings to develop a theory (Bryman & Bell 2015). "The purpose here would be to get a feel of what was going on, so as to understand better the nature of the problem" (Saunders 2011, p. 126). This approach goes from data to theory as opposed to the deductive approach that the research direction is from general to specific (Bryman & Bell 2015). Since the main objective of this research is to understand the relationship between SCN structure and the types of RMS by testing hypotheses, the deductive approach is suitable to be followed in this research.

4.4 Research strategy

There are five major research strategies including experiment, survey, archival analysis, history and case study (Yin 2013). Yin (2013) provides three factors that can help researchers determine which research strategies would be suitable for their own specific research. Table 4-1 demonstrates various conditions and shows how each factor is related to five major research strategies.

Based on the research questions which are provided in Chapter One and also section 4.7.1 in this chapter, two choices are available as a suitable research method: 'survey' and 'archival'. Since the research questions begin with 'what', two methods are suggested for answering them. Regarding the second factor (controlling of behavioural events) and the third factor (focusing on contemporary events), given that the researcher has no control over the behavioural events in the research process and is

also investigating contemporary research, both survey and archival method seem suitable for this research. The archival method uses administrative records and documents as the principal source of data (Chivaka et al. 2009; Marciano et al. 2018). However, since this research seeks to understand the SCN actors' position and the type of RMS that focal firms apply, and these issues are not usually recorded in documents formally, this method is ruled out of consideration. Thus, as the data that this research seeks is not as yet published, the suitable research method for conducting this research was 'survey'.

Table 4-1. Research strategies

Method	Form of the research question	Requires control of behavioural events	Focuses on contemporary events
Experiment	How, why?	Yes	Yes
Survey	Who, what, where, how many, how much?	No	Yes
Archival analysis	Who, what, where, how many, how much?	No	Yes/No
History	How, why?	No	No
Case study	How, why?	No	Yes

Source: Adapted from Yin (2013)

Furthermore, a survey has been identified as a suitable method for this research since it administers to a large sample to find insights about a phenomenon in business networks (Čirić 2014; Craighead et al. 2011). The phenomenon in this research is the relationship between a focal firm and its numerous SCN actors. SCNs usually involve more than two actors, which makes them more complicated in terms of accessing data and analysing the results (Frostenson & Prenkert 2015). By conceptualising and operationalising through a survey, the level of understanding of the phenomenon can

be increased within a "sizeable population in a highly economical way" (Saunders 2011, p. 144). To validate and expand the preliminary conceptual framework developed in Chapter Three, a survey method can usefully confirm or reject the existence of significant differences among variables. In addition, as this research consists of hypotheses and examines the sustainability practices from a network perspective, numerical data from numerous SCN actors is essential to test the hypotheses provided in Chapter Three. In this regard, a case study and experiment methods are not suitable as they provide in-depth investigation of limited cases. A history and archived analysis methods are also not suitable as they are not effectively focusing on contemporary events (Yin 2013). Therefore, a survey method was determined the most suitable option as it provides more accessibility to the required data from the SCN actors and focal firms' decisions about RMS (Matsuo et al., 2004).

4.5 Research choices

The business and management literature is replete with the terms quantitative and qualitative to address both data collection and analysis techniques (Bryman & Bell 2015). The quantitative method involves numerical data while the qualitative method uses non-numerical data (Sekaran & Bougie 2016). There are three main research choices that researchers can use in their research design process: mono method, multiple methods, and mixed methods (Creswell & Creswell 2017; Saunders 2011). The mono method is used when a researcher applies a single data collection and data analysis technique (for example a questionnaire). If the researcher uses more than one technique for data collection and analysis (for example a questionnaire and a structured observation analysis), the research choice is multiple methods. The purpose of using multiple methods is that "it is restricted within either a quantitative or qualitative worldview" (Saunders 2011, p. 152). Finally, if the researcher uses both numerical (quantitative) and non-numerical (qualitative) data, the research choice is mixed methods (Yilmaz 2013). As this research consists of hypotheses and examines sustainable development within networks, numerical data from numerous SCN actors is essential to test the hypotheses. This numerical data can help the conceptual framework's variables to be measured and analysed with statistics to ascertain the

accuracy of the hypotheses (Bell, Bryman & Harley 2018). Testing the statistical significance is routinely performed by quantitative researchers, not qualitative researchers (Trafimow 2014). A quantitative method is also appropriate in the case of testing a theory (Creswell & Creswell 2017), which is suitable to achieve the objective of this research to test a network theory in SCM. In addition, since this numerical data needs to be collected from numerous actors in focal firms' SCN, a questionnaire was deemed appropriate for this type of research. Thus, a mono quantitative approach was selected for this research.

In terms of time orientation, research can be conducted in two ways: cross-sectional research and longitudinal research (Bryman & Bell 2015). If the research examines a phenomenon at a specific time from more than one resource, it is called cross-sectional, while if the study examines a phenomenon change and development over time from the same source, it is called longitudinal (Saunders 2011). As this research investigates the effect of structure in a complex SCN, it is essential to collect data from numerous SCN actors. In addition, since the research questions aim to identify appropriate types of RMS in different organisations, collecting data at a single point of time can be useful. Accordingly, considering the limitations of time and budget for this research, the cross-sectional research was selected to collect data from numerous units of analysis.

4.6 Unit of analysis

One of the key aspects of the research method is the definition of the unit of analysis (Campbell & Rahman 2010; Brace 2018). The unit of analysis is concerned with the level of data that is aggregated and refers to the way that data is collected and analysed in the research (Bell, Bryman & Harley 2018). The unit of analysis could be an individual, organisation, group or region, or even the interaction among them (Näslund, Kale & Paulraj 2010). Since this research is investigating the position of various SCN actors in focal firms' SCN, the main unit of analysis is a SCN. Through this unit of analysis, firms can view themselves as a component of the interrelated network (Roscoe, Cousins & Lamming 2016). However, to reach the level of analysis in a network, this research analyses multiple dyadic RMS regarding sustainability

initiatives between two or more focal firms and their SCN actors. This means by collecting data at the dyadic level empirically, more insights on networks can be provided (Gualandris & Pagell 2015).

The empirical environment that this research investigates is the Australian food and grocery industry. There are four main reasons to choose this industry as a target industry. Firstly, the distribution of power in the food industry is usually imbalanced (Touboulic, Chicksand & Walker 2014). This means that a small number of large firms dominate this sector and exert a considerable amount of control over the other actors of their SCN (Henson & Humphrey 2010). The extent to which a firm can control and can be controlled have major impacts on how sustainability measurements are managed in SCN actors (Hingley 2005). Secondly, since the retail industry is considered a customer-driven industry and retailers have direct contact with the end customer, they have significant power over their suppliers which gives them more leeway to give new instructions (Obayi et al. 2017; Ochieng et al. 2014; Radaev 2013; Wagner, Fillis & Johansson 2003). Thirdly, food industries are exposed to sustainability incursions as they consist of particular environmental, social, and economic settings such as land use, rural livelihoods, and food security (Maloni & Brown 2006; Pullman, Maloni & Carter 2009; Thompson & Scoones 2009). This situation can lead to high risks in the agriculture sustainability of SCN and public exposure (Henson & Humphrey 2010). Fourthly, Australia has one of the most concentrated food retail industries around the world (Beaton-Wells 2015; Lu, Swatman & Daly 2005; O'Kane 2016; Wardle & Chang 2015).

Wesfarmers (currently trading as Coles) and Woolworths are the two main chains collectively holding more than 80% market share in Australia (Lu, Swatman & Daly 2005; O'Kane 2016; Wardle & Chang 2015). Moreover, to act on sustainability issues, retailers are dependent on the performance of their suppliers such as labour conditions, certificates of organic products, and calculating the carbon footprint of products (Wiese et al. 2012; Wilson 2015). Since collaborating with suppliers is considered a necessary initiative in undertaking and managing the sustainability programs (Wilson 2015), this research focuses on the relationship between suppliers (all the

manufacturers and suppliers which are also considered as SCN actors) and retailers in the Australian food and grocery industry.

4.7 Research design

The research design is a general plan that determines how to answer the research question(s) (Saunders 2011). It combines the research strategy with the research setting (Stone-Romero 2002). Having a clearly defined research design is important in the search for information about key features of the research (Harwell 2011). It can be considered as a bridge between research questions and the implication of the result (Goronga 2013). The process of the research design for this research is shown in Figure 4-1 (Creswell & Creswell 2017; Harwell 2011).

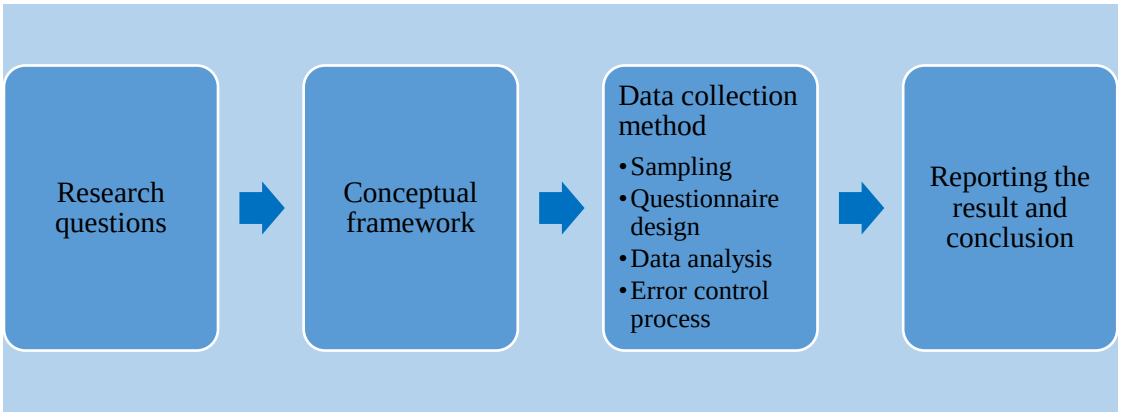

Figure 4-1. Research design process
Source: Adapted from Creswell & Creswell 2017

4.7.1 Research question

As mentioned in Chapter One (section 1.3), the main objective of this research is to investigate the type of RMS that focal firms apply to their SCN actor to make their SCN more sustainable. By identifying the research questions, the problem has been identified in the literature and a conceptual framework is designed.

4.7.2 Conceptual framework

A conceptual framework denotes a model that conceptualises the relationship between various constructs diagrammatically (Wagana & Kabare 2015). Having a conceptual framework is useful since it provides a map of the relationship between various

constructs, which can support the operationalising process (Cushon et al. 2011). Following the literature review, the conceptual framework for this research is shown in Figure 3-1. As indicated in Chapter Three, this framework identifies four factors (independent variables) for the SCN structure as well as four RMS (dependent variables) in the literature. The conceptual framework highlights that there is a relationship between these variables which needs to be investigated. To analyse this relationship, the data needs to be collected empirically.

4.7.3 Data collection method

Generally, there are four modes of survey administration for a quantitative research: face-to-face interview, telephone interview, mail survey and online survey (web-based survey) (Owens 2002; Santosa 2016). Due to the increasing number of Internet users, especially in firms, the web-based survey is being more widely used in the social sciences (Brenner 2015; Thomas, Gavin & Milfont 2015; Ebert et al. 2018). However, this research used a web-based survey for data collection process for the following, differing reasons. The web-based survey has potential benefits in terms of speed and cost of data collection (Santosa 2016). In addition, since this research investigates a number of SCN actors in the complex network, having access to numerous firms is a key point for this research, which is one of the key features of the web-based survey (Matsuo et al. 2004), and can be best fitted with the sample. Remaining anonymous in this method can also encourage more respondents to participate in the survey (Saunders 2011). More importantly, complex patterns can be programmed in this method (Owens 2002), which corresponds with the purpose of this research to understand how exactly the SCN structure can affect the RMS. Moreover, transferring responses directly into the database can also minimise the data entry and collection mistakes (Klassen & Jacobs 2001; Ebert et al. 2018). Between the mail survey and web-based survey, it has been shown that the web-based survey is faster than the mail survey (average of 5.97 days in comparison to average of 16.46 days) and the response rate is higher than the mail survey (44.21% for web and 26.27 for mail) (Cobanoglu, Warde & Moreo 2001). Ebert et al. (2018) also find that a web-based survey is more

cost-effective and have less number of missing values than a mail survey. Thus, the web-based survey was selected as the data collection method for this research.

4.7.3.1 Sampling

To answer the research questions, this research used sampling due to the restriction of budget and time for collecting data from the entire population. There are two types of sampling techniques: probability or representative sampling, and non-probability or judgemental sampling (Bell, Bryman & Harley 2018). This research used the probability sampling technique to address the research questions since it gives the research an opportunity to infer statistically the features of the population from the sample. In addition, the non-probability sampling technique is impractical when the researcher might need to make a statistical estimation of the populations' characteristics (Burger & Silima 2006). "Generalisations about populations from data collected using any probability sample are based on statistical probability" (Saunders 2011, p. 217). Thus, probability sampling is a balance between how much time and money is available, and how much accuracy the research seeks from analysing the data (Tillé & Wilhelm 2017). To conduct probability sampling, the following four steps are needed in the sampling process (Saunders 2011):

1. Defining the population and sampling frame according to the research questions.
2. Determining the sample size.
3. Deciding the sampling technique.
4. Checking the sampling' representativeness of the population.

The first step is concerned with identifying the population of this research with respect to the unit of analysis (the relationship between suppliers and retailers in the Australian food and grocery industry). In addition, according to the research questions, this research investigates appropriate types of RMS that focal firms can apply to create a sustainable SCN. Based on the definition of the focal firm in Chapter Three, this research finds Coles and Woolworths which are considered the top two retailers, holding more than 80% market share (Lu, Swatman & Daly 2005; O'Kane 2016; Wardle & Chang 2015) as focal firms in the Australian food and grocery sector. They

are leaders in this industry, initiating sustainability practices, collaborating with their suppliers and having a very complex SCN. In addition, since these two major retailers are integrating themselves at wholesale level and buying products directly from manufacturers/suppliers in their SCN (Lu, Swatman & Daly 2005), the population is comprised of all the manufacturers/suppliers that trade directly with Coles and/or Woolworths. This research refers to the firms that supply products to the retailers as suppliers.

The characteristics of the targeted respondent can also play a critical role in achieving high-quality responses and needs to be carefully considered (Awaysheh & Klassen 2010). Since it is impractical to ask multiple respondents within a firm to answer a lengthy questionnaire, the targeted individual needs to be well-defined (Awaysheh & Klassen 2010). This person must be familiar with SCM and the sustainability concepts in the SCN. Therefore, this research targeted the positions of supply chain manager for large firms or managing director/chief executive officer for small firms as the first priority, since they have knowledge about the SCN to analyse the SCN structure and the sustainability initiatives in their SCN to identify the type of RMS that their retailers apply to them to improve sustainability. However, as some firms may not have the position of supply chain manager or in the case of lack of accessibility to these two positions (SCM managers and CEO), the other positions related to SSCM could be the next priorities. These positions may include operation managers, sales and operations planning managers, environmental systems managers, account and field managers, sales managers, production managers, and general managers since each of them has sufficient information about the sustainability practices of their firm and their firm's position in the business network to answer the questionnaire. Thus, this research targeted the first priority positions (supply chain manager and managing director) and if they were not able to be identified, invitation emails went sent to the other positions (same priority).

In the second step, the suitable sample size was decided. To find the population, this research used Coles and Woolworths' online shopping websites, since there are no official websites that provide information from various manufacturers/suppliers

(brands of products) that are currently working with Coles and/or Woolworths. In addition, attempts have been made to communicate with the senior managers in these two retailers by presenting this research's abstract to have their contribution to this research, however, no responses were received from their side. This research also checked a report provided by the Australian Food and Grocery Council (2016) in which there are 6337 businesses (this number does not include the wine manufacturing sector) in operation from the food and beverage manufacturing sector in 2015-16. The number of businesses in this report may not be the population size since some suppliers may not have a relationship with one of these two retailers. They may sell their products via other retailers (such as IGA, 7-Eleven) or their own shopping stores. More importantly, there are some products in Coles and/or Woolworths that are sourced from overseas, which could not be identified by this number. In addition, due to some limitations such as the contribution of the top management in Coles and/or Woolworths to this research, the exact population number is not able to be identified. Thus, the only way to identify the population number was to find suppliers based on their brands of products. According to the Coles' and Woolworths' online shopping websites, there were 839 firms across different food and beverage product categories (such as dairy, meat, etc.) working with these two large retailers, which defines the population.

To answer the research questions, this research must use sampling techniques due to the restriction of budget and time for collecting data from the entire population. There are two main factors that need to be considered in deciding the sample size:

1 Desired confidence level which is the level of certainty that the characteristics of the entire population will be shown in the characteristics of the sample.
2 The margin of error, which is the accuracy of estimation in the sample.

This research applied the 95% confidence level and 5% margin of error for the targeted population, which makes a reasonable balance between the cost of collecting data and the value of the result. Therefore, based on the information in Table 4-2 the required sample size is 278.

After determining the sample size, in the third step, the sampling technique needs to be identified. Since the sampling frame can be found accurately from the online shopping websites and all this information comes from firms that have a business relationship with either Coles or Woolworth, simple random sampling was adopted to select the sample. “Simple random sampling is best used when you have an accurate and easily accessible sampling frame that lists the entire population” (Saunders 2011, p. 226). In addition, since each firm has an independent and equal chance of being selected for this research, the simple random sampling technique is suitable (Gupta & Shabbir 2008). This also can be supported by the fact that the technique is more relevant when there is uniformity at the sampling site (Lorenz & Dick 2011), which for this research is the firms’ shared situation of working directly with the retailers.

In the final step, the sample size needed to be checked to ensure that the results are the representatives of the entire population. “The sample needs to be representative of the population to produce a result of theoretical and practical value, that is, the results obtained from the sample must approximate to those that would be obtained if it was possible to survey the entire population” (Love et al. 2013, p. 1233). To address this issue, since this research used online shopping websites to gain information about the firms, this issue was automatically eliminated as the firms, which are extracted from the websites, are currently working with the retailers. In addition, some demographic questions such as ‘the duration of collaboration between the targeted firm and the retailer’ or ‘the position of the respondents within the firm’ were asked via questionnaire to ensure the representativeness of the findings (Saunders 2011).

4.7.3.2 The construction of the survey questions

Questionnaires can be considered a tool to capture individuals’ attitudes and knowledge about a specific subject (Brace 2018). This process can be conducted by choosing appropriate types of questions. To develop a questionnaire, a series of questions needs to be generated to extract the respondents’ opinion about a problem (Rattray & Jones 2007). Responses from participants will be transformed into numerical data and analysed by statistical methods (Brace 2018). A lack of appropriate tools and suitable instruments can affect the quality of data and mislead the conclusion

(Boynton & Greenhalgh 2004). Thus, choosing the right questions and the right format can increase the possibility of the right answers (Stehr-Green et al. 2003).

Table 4-2. Sample size at 95% confidence level in different sizes of the population

Population	**Margin of error**			
	5%	**3%**	**2%**	**1%**
50	44	48	49	50
100	79	91	96	99
150	108	132	141	148
200	132	168	185	196
250	151	203	226	244
300	168	234	267	291
400	196	291	343	384
500	217	340	414	475
750	254	440	571	696
1,000	278	516	706	906
2,000	322	696	1,091	1,655
5,000	357	879	1,622	3,288
10,000	370	964	1,936	4,899
100,000	383	1,056	2,345	8,762
1,000,000	384	1,066	2,395	9,513
10,000,000	384	1,067	2,400	9,595

Source: Adapted from Saunders (2011)

The questionnaire was developed based on the literature review, consisting of three main parts (Appendix A). The first part of the questionnaire relates to the demographic questions. The second part includes questions about four factors determining the SCN structure. The third part consists of questions about RMS that are implemented by

Coles and Woolworths respectively (same questions for both Coles and Woolworths were asked) to extend sustainability practices to their suppliers. If the respondent had the relationship with both Coles and Woolworths, he or she answered questions to the first, second and third part of the questionnaire completely. If the respondent only works with one of these two retailers, he or she answered questions to the first and second part and one section of the third part for either Coles or Woolworths.

To design the questions, a potential list of questions for related variables were compiled following the literature review. Then, the wording for each question was matched with the industry context of this research, as it is important that the language and design of questions are compatible with the way that respondents are familiar (Rowley 2014). Since the phraseology of questions is a key part of designing (Rowley 2014), the questions were checked in terms of succinctness, absence of implicit assumptions, and being neither vague nor general. In addition, some demographic questions such as the number of employees and the turnover of firms were also created. This format can help to examine the impact of the SCN structure on RMS to improve the sustainability of the SCN.

4.7.3.2.1 First part of the questionnaire

The first part of the questionnaire includes questions related to the profile of the respondents. Having responses from the demographic question is important as it can produce valuable reports specific to the demographic subgroups. There is debate in the literature regarding the placement of the demographic question (at the beginning or at the end of the questionnaire) (Teclaw, Price & Osatuke 2012). However, Teclaw, Price and Osatuke (2012) found that placing these types of questions at the beginning of the questionnaire can increase the response rate for demographic questions without having an effect on the other questions in the questionnaire. Five questions were developed to be answered by the respondents (Table 4-3). The first question was designed to gain information about the types of informants in the organisation. The answers helped to identify the extent of knowledge regarding sustainability in the SCN distributed among different job titles in the firms. The second and fourth questions were considered useful to identify the size of firms in the SCN and finding the

relationship between the size of the firm and the extent of their current sustainability practices. The third question was designed to identify how much the firm was known in the SCN which could be beneficial in understanding the relationship between the age of the firms and the extent of sustainability practices which they apply in their SCN. The fifth question was related to the location of the firm. This question was helpful to recognise different sustainability practices based on the different geographical location around the world.

Table 4-3. Demographic questions

No	Question
1	What is your job title?
2	How many employees (by headcount) are employed by your firm?
3	How many years has it been since your firm was founded?
4	What is the approximate annual turnover of your firm? (Both sales within your country and export)
5	In which country is your firm's head office located?

4.7.3.2.2 Second part of the questionnaire

In the first part, nine questions were developed to investigate 'dependency'. Since dependency is used in a two-dimensional context (Chang, Chiang & Pai 2012; Meqdadi, Johnsen & Johnsen 2017), the questions were designed to ask about the relationships between the targeted SCN actor and its focal firms. To avoid any confusion, this research provided a notification that the focal firm in the questions are Coles and/or Woolworths, as the SCN actor may work with both retailers. Five questions were developed by using data from a study conducted by Awaysheh and Klassen (2010) to investigate dependency. These six questions were designed to measure the extent to which a firm is dependent on its SCN actors for critical resources, components, or capabilities, which is quite compatible with the context of this research. To identify how much a SCN actor is related to the focal firm, the research applied two more questions according to Hoejmose and Adrien-Kirby (2012) and one question from Yilmaz, Sezen and Ozdemir (2005). These three questions (Table 4-4) were developed to emphasise the degree to which a focal firm and a SCN actor rely on each other within the relationship. Finally, the last question was

developed by using data from Touboulic, Chicksand and Walker (2014) to identify how much a relationship with a SCN actor is important for the overall business of the focal firm. Accordingly, a respondent's answer to these eight questions can help assess the degree that the focal firm is dependent on its SCN actor. After receiving results from pretesting and changing the wording of questions based on this research's context, the final questions were developed (Table 4-4) and presented in questions 11 and 20 in the questionnaire (Appendix A).

Table 4-4. Dependency's questions

Description	Source
We have difficulties making our business work if we decide to stop working with Coles and/or Woolworths.	(Awaysheh & Klassen 2010)
It would take a long time to replace Coles and/or Woolworths with new retailers.	
We find it very costly to replace Coles and/or Woolworths with new retailers.	
Our sales significantly decrease if Coles and/or Woolworths does not sell our products well.	
Our sales significantly decrease if Coles and/or Woolworths does not buy our products any longer.	
Having a good relationship with Coles and/or Woolworths is critical to our overall business.	(Touboulic, Chicksand & Walker 2014)
If we do not sell our products to Coles and/or Woolworths, they find it difficult to substitute our products.	(Hoejmose, Grosvold & Millington 2013)
It would be difficult for Coles and/or Woolworths to stop working with us.	(Yilmaz, Sezen & Ozdemir 2005)
Coles do not have alternatives to our products.	(Hoejmose, Grosvold & Millington 2013)

In terms of distance, six questions were designed to analyse this factor (Table 4-5). The distance can be measured as a physical distance, organisational distance, and cultural distance (Awaysheh & Klassen 2010). For measuring physical distance, two

questions were developed by using data from Cummings and Teng (2003) who define physical distance as a level of difficulty in running a face-to-face meeting with a business partner. In this way, two questions investigated this meaning in terms of time and cost aspects. For measuring organisational distance, one question was developed by using data from Ralyté et al. (2008) and one question was developed by using data from Parjanen, Harmaakorpi and Frantsi (2010) to address the level of difficulty in sharing and exchanging information among two firms. The last two questions were related to the cultural differences which can be defined as the level of differences in cultural standards and values (Abooali & Mohamed 2012). The final result is shown in Table 4-5 and presented in questions 13 and 22 in the questionnaire.

Table 4-5. Distance's questions

Description	Source
It takes too much time to schedule a face-to-face meeting with Coles and/or Woolworths.	(Cummings & Teng 2003)
We find it very costly to hold a face-to-face meeting with Coles and/or Woolworths.	
We do not exchange critical information about our products with Coles and/or Woolworths.	(Ralyté et al. 2008)
Exchanging information about our products with Coles and/or Woolworths is difficult.	(Parjanen, Harmaakorpi & Frantsi 2010)
The organisational cultures (such as values, beliefs, and assumptions) of our firm and Coles and/or Woolworths are different.	(Gooris & Peeters 2014)
The communication tools we use are different to Coles and/or Woolworths.	

To measure the power of SCN actors, ten questions were developed by using data from the literature and categorised into five sources (Table 4-6). Since this research used this factor to investigate the level of influence that a SCN actor had in the macro-level, these five common sources of power have been used to analyse the power comprehensively (Zhao et al. 2008). In addition, these common sources were suitable for analysing power in any interpersonal or inter-organisational relationships (Byrne & Power 2014). These sources were fully explained in Table 3-6 in Chapter Three. Various authors have analysed this type of power in different contexts regarding different questions (Le, Cheng & Tran 2018; Maloni & Benton 2000; Shields &

Malhotra 2008; Zhao et al. 2008). After analysing those questions, the similar questions were joined and finally, two questions for each category were designed. The final result is shown in Table 4-6 and presented in question 7 in the questionnaire.

Table 4-6. Power's questions

Sub-factor	Description	Source
Expert power	We provide good advice to firms in our business network about their products/services.	(Le, Cheng & Tran 2018; Maloni & Benton 2000; Shields & Malhotra 2008; Zhao et al. 2008)
	Firms in our business network find the knowledge of our experts about their products/services valuable.	
Referent power	Firms in our business network are proud to be closely associated with us.	
	Firms in our business network admire us as an attractive reputational resource.	
Legitimate power	Firms in our business network comply with our requests, even if there is no contract between us.	
	We expect firms in our business network to accommodate our requests, even if there is no contract between us.	
Reward power	We can offer incentives to firms in our business network so they comply with our requests.	
	Firms in our business network cooperate in implementing a new practice if we provide incentives.	
Coercive Power	We have the ability to impose penalties on firms in our business network if they do not accept our requests.	
	We do not treat firms in our business network very well if they do not accept our requests.	

The fourth factor in the second part of the questionnaire is transparency. This factor determines how much information about a SCN actor is available in the macro-level (Parris et al. 2016). Five questions were developed by using data from Awaysheh and Klassen (2010) since they covered key items in the various definitions of transparency (Table 4-7). These items can be addressed as the information availability (Egels-Zandén, Hulthén & Wulff 2015), disclosing information to various stakeholders (Parmigiani, Klassen & Russo 2011; Parris et al. 2016), disclosure of information about supplier's name, and purchasing practices (Egels-Zandén, Hulthén & Wulff

2015), and the accuracy of data (Pant, Prakash & Farooquie 2015; Wognum et al. 2011). Therefore, these five questions were designed to be in the questionnaire. The final result is shown in Table 4-7 and presented in question 6 in the questionnaire.

Table 4-7. Transparency's questions

Description	Source
Firms in our business network know how our products are produced.	(Awaysheh & Klassen 2010)
Firms in our business network can track our products from raw materials to the end customers.	
Firms in our business network can find information about our suppliers.	
Firms in our business network know about the types of raw materials/components in our products.	
Firms in our business network know our brand names.	

4.7.3.2.3 Third part of the questionnaire

In the third part of the questionnaire, the questions for the four RMS in the conceptual framework were designed and presented in questions 15 and 22 in the questionnaire. Regarding the 'non-compliance' strategy, three questions are developed by using data from the literature (Table 4-8). Since in this RMS a focal firm has no intention to address sustainability issues of its SCN actor (Lee & Ball 2003), questions were designed to cover this unwillingness from three aspects. The first question was developed by using data from Lee and Ball (2003) to measure how much a focal firm intends to take steps towards managing sustainability issues of its SCN actor. The second question was developed by using data from Tachizawa and Wong (2014) to investigate this RMS from the SCN actors' perspective by measuring how SCN actors understand the type of RMS that their focal firm applies to them. The third question

was developed by using data from Mena, Humphries and Choi (2013), investigating from the viewpoint that if a SCN actor tends to provide information to its focal firm, just how important it could be for the focal firm. These three questions were designed to measure how much a focal firm has a tendency to adopt the non-compliance RMS.

Table 4-8. Non-compliance RMS's questions

Description	Source
Coles and/or Woolworths has no interest in addressing sustainability issues (such as water conservation, recycling, workforce rights) of our firm's practices.	(Lee & Ball 2003)
We do not need to report our sustainability practices to Coles and/or Woolworths or its representatives.	(Tachizawa & Wong 2014)
Our sustainability practices are valuable for Coles and/or Woolworths.	(Tachizawa & Wong 2014)

Three questions were developed by using data from the literature to address the 'transactional' strategy (Table 4-9). In this RMS, focal firms have greater incentive to manage sustainability practices in their SCN actors than the previous RMS; nonetheless, they are not highly interested in following up the sustainability requirements within the SCN actors' overall business environment (Lee & Ball 2003). The first question explores this strategy from the perspective of having minimum requirements and standards of sustainability issues which can be considered as being a sign of transactional RMS (Lee & Ball 2003; MacCarthy & Jayarathne 2012). The second question is concerned with how a focal firm controls and manages the sustainability practices of its SCN actor to ensure the sustainability of the SCN. In a transactional RMS, focal firms usually use external sources such as NGOs or other

third parties (Miemczyk, Johnsen & Macquet 2012; Min & Galle 2001; Tachizawa & Wong 2014). Since the level of information sharing can affect the depth of collaboration among two business actors (Soosay & Hyland 2015), the third question measures this aspect to analyse the degree of information sharing between the focal firm and its SCN actors.

Table 4-9. Transnational RMS's questions

Description	Source
Coles and/or Woolworths only asks us to meet minimum requirements of sustainability issues.	(Lee & Ball 2003; MacCarthy & Jayarathne 2012)
Coles and/or Woolworths uses external sources such as its suppliers, or other third parties to audit or evaluate our sustainability practices.	(Miemczyk, Johnsen & Macquet 2012; Min & Galle 2001; Tachizawa & Wong 2014)
We have a low level of information sharing with Coles and/or Woolworths in terms of sustainability practices.	(Soosay & Hyland 2015)

Regarding the 'dictatorial' strategy, seven questions were developed by using data from the literature (Table 4-10). Since the main idea behind this RMS is the dominance of a focal firm over its SCN actors (Drucker & Noel 1986), the questions were designed in a way that addresses this dominance. To analyse this RMS in sustainability, the main items considered the focal firm's abilities to audit its SCN actors by its own resources (Andersen & Skjoett-Larsen 2009), terminate the relationship with SCN actors (Harms, Hansen & Schaltegger 2013), push SCN actors to obey desired requirements (Awaysheh & Klassen 2010), impose norms and standards on SCN actors (Neville & Menguc 2006), mandate SCN actors to purchase from pre-selected suppliers (Tachizawa & Wong 2014), and force SCN actors to perform practices

regardless of their constraints (Jharkharia & Shankar 2006). Other items such as applying sanctions to supplier evaluation results (Peters 2010) and creating pressure on SCN actors (Maloni & Benton 2000) can be categorised into those main items. To address these issues, questions were desinged to cover each item separately.

Table 4-10. Dictatorial RMS's questions

Description	Source
Coles and/or Woolworths audits our sustainability practices by its own auditors.	(Andersen & Skjoett-Larsen 2009)
Coles and/or Woolworths audits our sustainability practices regularly.	
Coles and/or Woolworths is able to terminate the relationship with us in the case of non-compliance with sustainability standards (such as codes of conduct).	(Harms, Hansen & Schaltegger 2013)
Coles and/or Woolworths urges us to follow its own sustainability standards.	(Awaysheh & Klassen 2010)
Coles and/or Woolworths imposes sustainability standards on our firm.	(Neville & Menguc 2006)
Coles and/or Woolworths provides us with a list of pre-approved suppliers and asks us to source our components and materials from them.	(Tachizawa & Wong 2014)
Coles and/or Woolworths urges us to initiate sustainability practices irrespective of our constraints.	(Jharkharia & Shankar 2006)

The last type of RMS in the questionnaire is the 'collaborative' strategy. In this RMS, a focal firm enters close cooperation and joint activities with the supplier which are beneficial for each participant (Detomasi 2007; Frenkel & Scott 2002). In this way, the focal firm directly participates in mutual projects with its SCN actors to improve the sustainability of its SCN (Skjoett-Larsen, Thernøe & Andresen 2003). Six

questions were developed by using data from the literature to measure this RMS within the relationship between the focal firm and its SCN actors (Table 4-11). Based on the definitions of the collaborative approach, the main principle of having a collaborative RMS is related to the mutual effort that two firms are making to create a competitive advantage (Simatupang & Sridharan 2002). To dissect the mutual effort in sustainability, this research explored the literature and identified various items such as setting goals mutually, having a close relationship, providing assistance and training to suppliers, providing sustainability knowledge, working on joint activities, and involvement in shared projects. These items were turned into questions to investigate this type of RMS in the SCN.

Table 4-11. Collaborative RMS's questions

Description	Source
Coles and/or Woolworths collaborates with us in setting goals regarding sustainability issues.	(Beske & Seuring 2014)
There is a close cooperation between our firm and Coles and/or Woolworths in implementing sustainability practices.	(Crespin-Mazet & Dontenwill 2012)
Coles and/or Woolworths provides education to our personnel to improve their knowledge in managing sustainability issues.	(Harms, Hansen & Schaltegger 2013)
Coles and/or Woolworths provides assistance to our personnel to improve their knowledge and skills in managing sustainability issues.	(Tachizawa & Wong 2014)
There are many joint activities between Coles and/or Woolworths and our firm to manage sustainability issues.	(Vurro, Russo & Perrini 2009)
Coles and/or Woolworths directly involves us in various practices related to sustainability issues.	(Skjoett-Larsen, Thernøe & Andresen 2003)

Various types of questions can be used when a researcher designs a questionnaire. They can be categorised into two types: closed questions and open questions (Krosnick & Presser 2010). Since the main objective of this research is to find the relationship between two independent variables (SCN structure and RMS), closed questions seem suitable for this research. In addition, closed questions can be considered as suitable types of questions in web-based surveys since respondents are not interested in open questions when they are using IT tools in comparison to interview methods (Saunders 2011). By collecting data via this type of question, this research is able to quantitatively analyse and find the statistical treatment for the research questions (Tsekleves, Aggoun & Cosmas 2013). Moreover, based on the nature of questions, this research used Likert's technique asking respondents to determine their level of the disagreement and agreement. This method can help to translate qualitative data (respondents' judgment about the questions) to quantitative data, which make it ready for statistical analysis (Junio-Sabio 2012). There is not an agreement on the number of points on rating scales (Krosnick & Presser 2010), however, Krosnick and Presser (2010) find that a 7-point scale is probably the optimal number of points in the Likert technique as it provides adequate reliability and validity. For example, Krosnick (2018) find that a 7-point scale would be more desirable than a 5-point scale for respondents who make more fine-grained distinctions. Very long scales are not effective as they provide a difficult situation for respondents to choose between many options, while too few scale points might make it challenging for respondents to express moderate options (Krosnick 2018). He also argues that finding the appropriate verbal labelling is more challenging when the number of scales increases beyond 7 points. Thus, this research used the 7-point scale in its closed questions.

4.7.3.2.4 Open-ended questions

The open-ended questions were considered a complementary part for the second and third sections of the questionnaire in soliciting information from the informants (Table 4-12). The first open-ended question was designed to gain greater understanding about the factors associated with the structure of the SCN in the second part. This aimed to

gain deeper insights to answer the first subsidiary question of this research. The second and third open-ended questions were designed to add more information regarding the existing sustainability practices in the SCN. This part provides the answer to the second subsidiary question of this research. The fourth open-ended question was designed to acquire further information on the relationship between the SCN structure and types of sustainability practices. This part seeks to answer the third subsidiary question of this research.

Table 4-12. Open-ended questions

No in the questionnaire	Question
8, 14, 23	What factors affect your firm's position within your business network? Why?
16, 25	What other types of practices does your firm and Coles and/or Woolworths perform together to manage sustainability issues within your business?
17, 26	Aside from existing sustainability practices in your firm, what other practices do you think Coles and/or Woolworths can initiate to improve sustainability in your firm that would be beneficial for both firms? Why?
18, 27	How does your firm's position in the business network affect the type of sustainability practice between your firm and Coles and/or Woolworths?

4.7.3.3 Pre-testing and modifying the survey instrument

Having difficulties to interpret the questionnaire has been a common problem for respondents and it has been frequently addressed in the literature (Hilton 2017; Krosnick & Presser 2010; Nanda et al. 2013). “Pretesting is a method of checking that questions work as intended and are understood by those individuals who are likely to respond to them” (Hilton 2017, p. 21). It helps to prevent various types of mistakes such as layout, wording, and order (Krosnick & Presser 2010). In addition, a basic reflection of the population viewpoint can be achieved by pretesting the questionnaire (Nanda et al. 2013). Thus, pretesting can offer valuable insights before conducting the main survey process.

To conduct the pretesting process for this research, academic and industry expert reviews were applied to ensure the questionnaire was ready for the main process. This

method was selected since it provides noteworthy insights from multiple perspectives, identifies the highest rates of issues, and is less time consuming (Brace 2018; Nanda et al. 2013) and inexpensive to conduct (Krosnick & Presser 2010). In the first stage, the questionnaire was sent to 11 academic and industry experts (by email or hardcopy) to gain wider perspectives and also provide valuable feedback for the next stage. In the second stage, a meeting was held with the research team to discuss comments received from the first stage. The discussion was chaired by the researcher to ensure that the questionnaire received all the information required for analysing the result. In the meeting, the researcher focused specifically on the structure of questions, wording and terminology, ordering of questions, typographical errors, and procedures for survey administration. These experts were selected as they have valuable experiences related to the SCN and sustainability. Having experts from related industries can help to identify potential failures in the main survey process (Nanda et al. 2013). After modifying the questionnaire through comments in the two stages, the revised questionnaire and other documents were sent to the ethics committee at University of Tasmania for ethical approval.

4.7.3.4 Survey administration

After determining the population and sampling size, designing the questionnaire, testing the questions' format, and finding the email addresses of the relevant supplier expert, the questionnaire was ready to send. Having a clear timetable that clarifies the tasks and resources which needed to be provided is important. This can help the researcher to receive a good response from participants (Creswell & Creswell 2017; Saunders 2011). As discussed in the data collection method section, this research found the web-based questionnaire suitable to collect data from the population. The following measures provide follow-up activities, which are required to encourage respondents to reach a higher response rate for the questionnaire distribution process.

To provide access to the questionnaire for respondents via the Internet, this research created a web-based questionnaire on the Survey Monkey website. Survey Monkey (www.surveymonkey.com) was used as an online system to provide respondents a link to the web-based questionnaire due to its popularity, ease of use (Phillips 2015),

reliability in industry (Pretorius, Hobbs & Fenn 2015), and variety of use in similar studies (Ellram & Tate 2016). First, an account was created and then the desired questionnaire designed on the website. After finalising the questions and question design, a web-link was created, which could be pasted in the invitation letter to access the questionnaire. To find the email address for respondents the following procedure was developed (Figure 4-3). After identifying the population and sample size in the first and second step (already explained in detail in the sampling section in this chapter), this research used various websites including Company 360, LinkedIn, the Australian Bureau of Statistics (ABS), and the firms' own websites (which were found through Coles and Woolworths' online shopping websites) to identify the suppliers in the two retailers' SCN. By identifying the name of firms in the Coles and Woolworths online shopping process, the firms' websites were identified. The names of their key managers were initially sought on their websites' 'contact us' pages or organisational charts. However, this type of information rarely exists on the firm's websites. If the key managers could not be identified in this way, the firm was searched on the Company 360 website, which provides various information on a firm's website, phone directory and most importantly, key contact points. Due to the limitation related to the Company 360 website's updating process, the key managers were searched simultaneously in the LinkedIn website to make sure that those managers were still working at the targeted firm. Finally, if the key managers for suppliers could not be identified by these websites, the final way was to call the targeted firms and ask the names and emails of desired individuals by phone. If they were not interested to participate in a survey (for example, by their organisations' policy), more suppliers were added to sample size by random sampling (step two).

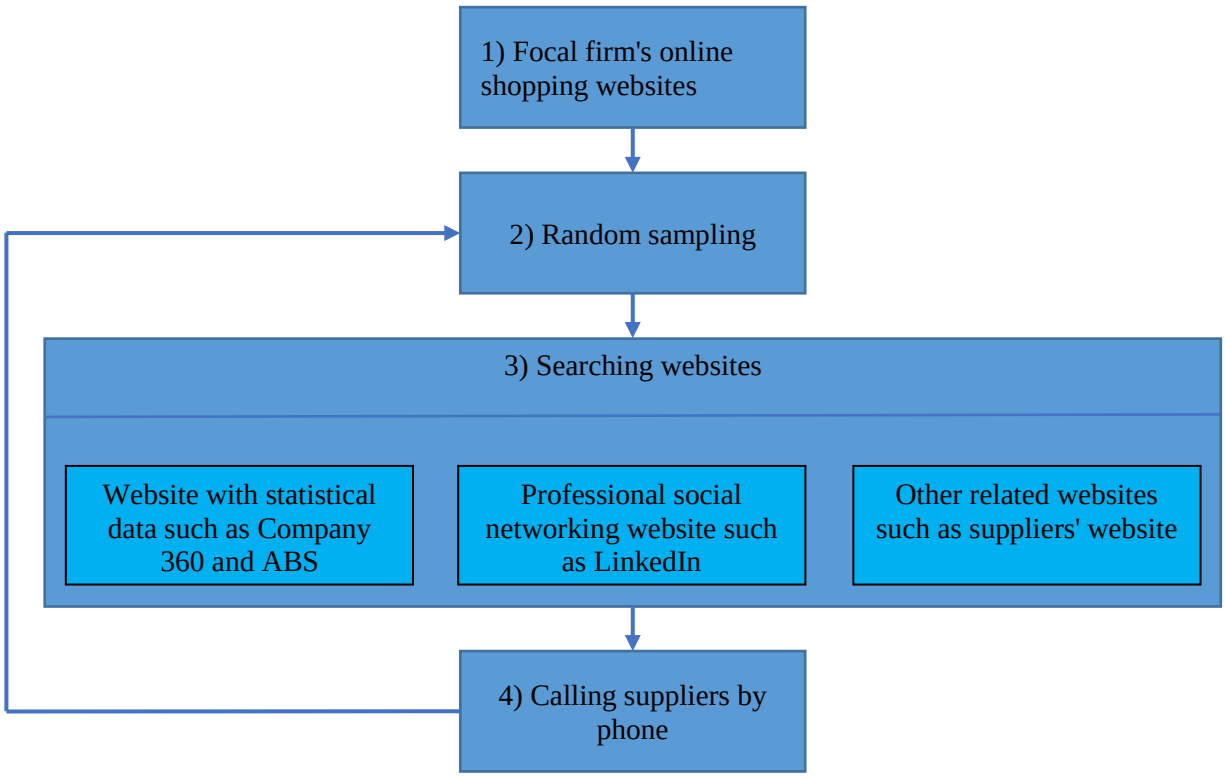

Figure 4-2. A procedure to identify suppliers in a focal firm's SCN

The invitation letters (Appendix B) were personally addressed so as to maximise the response rate, for example, 'Dear Mr. Alison', as it is important to maximise success in achieving a high response rate (McPeake, Bateson & O'Neill 2014). After introducing the questionnaire, personally engaging the respondent and stating the research's objectives, the respondents were guided to the Survey Monkey hyperlink. The letter also includes an information sheet as an attachment to provide more information to the respondents (Appendix C). The questionnaire was estimated during pretesting to take around 20 minutes to complete and the completed questionnaire implies the respondents' consent in participating in the study. To improve the response rate, it was necessary to send at least one reminder after one week of distributing the questionnaire (Rowley 2014). In comparison to other incentives, using reminders by email or telephone can be relatively strong (Van-dongen et al. 2013) and are frequently used in questionnaire distribution to enhance the response rate (Christensen et al. 2015; McPeake, Bateson & O'Neill 2014). Thus, this research used two reminders

after the first email to follow up on the responses as it has been shown to improve response rates (Eitayeb, Zailani & Jayaraman 2010; Hsu et al. 2013; Lemoine & Skjoett-Larsen 2004; Soltanian et al. 2016). After one week, the first reminder was sent to each respondent. This email (Appendix D) consisted of a 'thank you' expression for those who had already responded to the questionnaire and also reminded other participants who did not respond to follow the web link to the questionnaire.

The data collection process started on October 1, 2017. The survey remained open for three months and the data collection process finished on December 31, 2017. Three weeks after the initial email was sent, the second reminder was sent to each participant. The email contained the same content as the first reminder.

4.8 Error control process

Ideally, the survey administration and data measurement can be a perfect representation of the population, which this research aims to investigate. However, this level of perfection rarely occurs in the practical stage (Krosnick & Presser 2010; Krosnick et al. 2018). Being exposed to different types of errors are well accepted in the literature (Groen 2012; Brace 2018). This research employed various strategies to mitigate the risk of different errors. Generally, the following steps were taken to manage unexpected errors:

- Conducting numerous meetings with the supervisory team with the objectives of exploring and managing the research design from the literature review to the data analysis section.
- Conducting free discussions with other research colleagues at the Australian Maritime College (AMC) to gain more information about the research objectives, methodology, and result.
- Conducting the pre-test process including 11 academia and industry experts and having their feedbacks in the survey process.
- Using SurveyMonkey and providing a user-friendly environment for respondents to participate in the survey.

There are normally four types of errors, which may render the findings less meaningful: sampling error, non-coverage error, nonresponse error and measurement error (Collier & Bienstock 2007; Creswell & Creswell 2017; Dillman 1991). Each of which are discussed below.

4.8.1 Sampling error

Sampling error is the deviation between the value of the sample data and value of the targeted population (Mertler & Reinhart 2016). This includes situations where the element is not considered to be part of the target population (Celsi et al. 2011). In this research context, this type of error may occur if the firms surveyed were not working in the two retailers' food SCN. Sampling error can be controlled by the sample size and the survey design (Baldwin 2018). As explained earlier, this research used a comprehensive list of firms (suppliers/manufacturers) in Coles' and Woolworths' SCNs. To find the list, this research followed a procedure (as explained in Figure 4-3 in Chapter Four) which began by searching the firms' names on Coles' and Woolworths' online shopping websites. As such, the firms names (as identified based on the brand name of the products) show the existing business relationships between the two retailers and the firms. Since this research found firms through the two retailers' online shopping websites, the accuracy of the sample size was improved which minimised sampling error and expected difference (Adams, Khan & Raeside 2014; Arber 2001). Thus, the defined procedure provided a suitable sampling size, an advantage which can reduce the sampling error.

4.8.2 Non-coverage error

Non-coverage error happens when part of the members of the targeted population are not included in the sampling frame (Ghauri & Chidlow 2017). To mitigate the risk of non-coverage error, Alvarez and VanBeselaere (2003) propose that the researcher seeks to identify the whole population to ensure that the sampling frame is within the population size. Since in this research the sampling frame (all the suppliers/manufacturers that are currently working with two retailers) was exactly selected from the targeted population, therefore, there was little risk of this type of error.

4.8.3 Nonresponse error

Nonresponse error refers to the fact that the value of data which is not gathered from non-respondents, can have a significant impact on the value of data which is collected by respondents (Dillman 1991; Brace, I 2018). The unwillingness of the respondents to participate in the survey alongside their lack of computer skills can be considered as the main reasons for this type of error arising (Saunders 2011). To reduce the risk of this type of error, the following steps were taken in this research:

Using follow-up methods such as sending two reminder's letters and placing telephone calls to the main contact points at the firms, which has been shown to be useful (Couper 2007). This is also supported by Dilman et al. (2009) who proved that the response rate can be increased by 1) sending reminders to those participants who did not respond to the survey two weeks after the first distribution of the survey 2) repeating this process after one week. Comparing the result of early responders and late responders to identify the extent of differences between these two categories. This is called the wave approach, which assumes that the late responders are similar to non-responders on important attitudinal factors (Meterko et al. 2015). Thus, if the result is similar, there are no differences between non-respondents' answers and respondents' answers. Otherwise, the replacement respondents were randomly drawn from the population. Using the T-test can provide the required significance level (less than 5%) to make a decision about the possibility of nonresponse bias (Yang & Wei 2013). Comparing the characteristics of the respondents (through demographic questions) with the expected characteristics of the population to identify the extent of differences between them (Collier & Bienstock 2007). If both characteristics do not differ from each other, the sample can be regarded as the appropriate representative of the population. Otherwise, like the previous steps, the replacement strategy was used.Applying initiatives such as making the questionnaire short, easing the reading process by using graphic and various question writing techniques, and ordering the most interesting questions at the start can also be useful to improve the response rate.

4.8.4 Measurement error

Measurement error increases when respondents cannot provide accurate and clear information (Dillman 1991; Andrich & Pedler 2018), which causes considerable differences between "the information desired by the researcher and the information provided through the measurement instrument" (Collier & Bienstock 2007, p. 164). This error also happens when the sequence of questions is not controlled appropriately (Cui 2003). Since this research used the web-based survey and the researcher neither interfered nor affected the respondents' attitudes, this error was minimised. In addition, this type of error may arise from the ordering of questions, wording and questionnaire layout, which makes the questions ambiguous (Dillman 1991). By using the pre-test process and controlling the potential source of this error via a group of experts, this research managed to reduce the measurement error. Eliminating lengthy questions and statements, using simple grammar to reduce the ambiguity in the questions, removing poor and negative wording in the questions and statements, and eliminating irrelevant questions that did not measure the objectives of this research were the results of the pre-testing process which mitigated the risk of measurement error (Bell, Bryman & Harley 2018). In addition, by providing an invitation letter (Appendix B) and information sheet (Appendix C) to each respondent, the measurement error can be avoided as suggested by Dillman (2011) and Punch (2013). This research also used two options of 'don't know' and 'not applicable' to assist respondents in answering the questions. Although adding 'don't know' and 'not applicable' options decreased the number of responses, they reduce the measurement error by not forcing the respondent to choose statements randomly (Dedrick & Greenbaum 2011).

Moreover, the measurement error can be handled by considering two factors: reliability and validity (Fink 2015). Failure to critically investigate the source of error can lead to the reliability and validity issues (Hair et al. 2007; Zikmund et al. 2012; Brace 2018). Reliability refers to how much the data collection and data analysis process provide repeatable, stable, and consistent results (Leung 2015). Using a large number of items and measuring the sum of scores (Craigie et al. 2002; He 2018) and

simplifying the items (Fink 2015) can improve the reliability of the research design. To increase reliability, this research used multiple items (questions) to analyse each factor of the SCN structure and RMS. In addition, during the pre-test process, the items for each factor will be simplified. This research also applied one of the most common methods to determine the reliability called Cronbach's alpha (Taber 2018). Validity refers to the accuracy in measuring the concepts in the questionnaire (Leung 2015). In this research, content validity or face validity and construct validity were managed by the pretesting process, in which a group of experts considered how much the scale items of the questionnaire are closed to the proposed domains or concepts. Using other sources of information and comparing with the main source of information can be another effective way of measuring the validity (Sjöström, Holst & Lind 1999). In this way, this research used four industry professionals' ideas in designing the questionnaire.

4.9 Summary

This chapter discussed the research methodology and the way the research questions will be answered. By following the deductive approach, this research used the survey method to obtain the required information from the targeted respondents. As this research investigates the SCN structure and sustainability issues within the complex SCNs, the Australian food and grocery industry was selected to address research problem. To test the hypotheses, numerical data are needed which makes the quantitative methods most suitable for both data collection and data analysis. Accordingly, a web-based questionnaire was identified as the data collection instrument. To improve the quality of the questionnaire, reviews and comments from a group of experts were taken into account in several steps. Using the questionnaire, the quantitative data were collected and then analysed through the multiple regression analysis (more details will follow in Chapters Five and Six) to explore the RMS that two large retailers apply to their SCN to improve sustainability in the Australian food and grocery industry. The result of the empirical case will be discussed in the following chapters.

CHAPTER 5 DATA ANALYSIS - FACTOR CONSTRUCTION

5.1 Introduction

To provide a direct link between research questions and discussion of the findings, this research divides the data analysis section into two chapters, Chapter Five and Chapter Six. Chapter Five uses the collected data from a web-based survey and presents the first of two chapters on data analysis and discusses the results whilst Chapter Six analyses data based on the outcomes of Chapter Five. The current chapter analyses the data and answers the following first and second subsidiary questions stated in Chapter One:

- SRQ1: What types of relationships exist between the focal firm and SCN actors to incorporate the sustainability concept into a SCN?
- SRQ2: What are the factors that determine the structure of relationships between SCN actors within a SCN?

The chapter begins with the response rate achieved from the web-based survey and then examines the various aspects of the survey respondents' characteristics. Next, EFA is conducted for both the SCN structure and the RMS. Finally, the EFA results and information from open-ended questions are discussed.

5.2 Response rate

Through a random sampling technique, 278 firms were selected. After distributing the questionnaire with two rounds of reminders over a period of three months, 133 responses were received. A total of 66 questionnaires were returned completed, equating to a response rate of 24%. This is an acceptable response rate for this field as other studies have reported a similar range such as 21.5%, 23%, and 15.96% in the studies of Balasubramanian et al. (2017); Tarofder et al. (2017); and Wang & Feng (2012), respectively.

5.2.1 Response rate limitation

According to American Association for Public Opinion Research (AAPOR), "the response rate is generally defined as the number of completed units divided by the number of eligible units in the sample" (Mokadem 2016, p. 348). A low response rate can be considered as a major concern among other web survey challenges in threatening the reliability of the web survey (Fan & Yan 2010). As the number of questionnaires received in this study is low, this can affect the generalisability of the findings beyond the sample. Attempts have been made to address the significance of this issue, for example, in section 5.3.1, it was found there were no significant differences between the two groups of early and late responses, which may imply that non-response bias is not a substantial issue in the collected data. In addition, the validity and reliability of the data have been checked with related techniques (section 5.5) resulting in the internal validity of the findings. However, the sample size's ability needs to be assessed to underpin the extend of generalisability from a sample to a population. To calculate the sample size, a number of authors (Saunders 2011) applied the following formula:

$$n = \frac{Z^2 * (p) * (1-p)}{e^2}$$

Where:

n = The required sample size,

z = Critical value of the normal distribution at the required confidence level,

p = Sample proportion,

e = Margin of error (confidence interval)

As explained in section 4.7.3.1, this study considered a 95% confidence level with 5% margin of error. The confidence interval is the range of values below and above the sample statistic in a confidence level which shows the extent of uncertainty in a certain statistic by analysing how many percentage points the results from a sample will differ

from the population value (Saunders 2011). Based on the current usable responses, this study needs to find out the actual confidence interval to have a better understanding of the sample. To calculate the confidence interval for the findings of this study, the following formula can be set up:

$$e=z\sqrt{p\ (1-p)/n}$$

Therefore, the confidence interval of the sample size which is received in this study (66 usable questionnaires) is 12% which is higher than the original value expected from this study (5%). A higher confidence interval demonstrates the less likelihood of relying on the findings of a survey (Saunders 2011) resulting in a less precise sample size (Sahu and Sugumaran 2014).

$$1.96 * \sqrt{0.5\ (1-0.5)/66} = 12\%$$

Since the confidence interval shows the imprecision inherent in survey data, the sample size of this study is not statistically representative of the population. In this regard, due to the limited number of responses, the findings may not be an adequate representative of the two SCNs, and therefore, the findings discussed in Chapters Five, Six and Seven should not be generalised across the entire population. The low number of received questionnaires and the impact on generalisability of the findings is also further addressed in the limitations section of Chapter 7 (see section 7.4).

5.2.2 Missing data

To increase the reliability of the data received from the questionnaire, this research added two options of ‘don’t know’ and ‘not applicable’ to the seven-point Likert scale. Having these two options can increase the chances of measuring the actual knowledge of respondents and can help them to more accurately select an answer (Page & Uncles 2004). The rationale is that as the respondents may not have sufficient knowledge of their organisations, these two options can cover the respondents’ inability to make a judgment which stems from the lack of available information and lack of trust to disclose the information (Ranacher et al. 2017).

The current research treated the options of ‘don’t know’ and ‘not applicable’ as missing data (Ashton, Pilkington & Lee 2014; Koys & DeCotiis 2015; Roberts & Toleman 2007; Sirgy et al. 2008). To deal with missing data, two solutions are selected as proposed by Kline (2016): 1) eliminating the questionnaire; and 2) imputing the missing data. As supported by various literature (Cennamo & Gardner 2008; Kladou & Kehagias 2014; Whitehead, Zacharia & Prater 2016; Yusup et al. 2015), questionnaires with more than 10% data are removed from further analysis. For questionnaires with less than 10% missing data, the mean substitution is used to impute the missing data as suggested by the literature (Bayraktar et al. 2009; Lin 2013; Nguyen et al. 2017; Petersen, Handfield & Ragatz 2003; Willis, Genchev & Chen 2016). By using these two solutions, the results indicate that out of 133 received questionnaires, 101 (76%) respondents completed the demographic questions of the web-based survey which the first five questions shown in Appendix A as well as questions 6 and 7 which require knowledge of the business network to be answered. Of these 101 questionnaires, 55 respondents completed questions 11, 13, 20, and 21 which require knowledge of the relationships between suppliers and Coles and/or Woolworths to be answered. This means that 46 respondents did not have sufficient knowledge of their firms’ relationship with Coles and/or Woolworths or they did not intend to share this detail due to possible sensitivities if they were recognised by the retailers. Of these 55 questionnaires, 36 respondents completed questions 15 and 24 which require knowledge of sustainability practices managed by Coles and/or Woolworths to be answered. As explained in Chapter Four, each questionnaire has two parts. The first part includes questions to identify the firms’ structure in their SCN. The second part is divided into two sub-parts. The first sub-part includes questions asking firms about the extent of their business relationship with Coles and also the RMS that Coles applies to manage sustainability issues in their firms. The second sub-part asks the same questions but relating to Woolworths. Of the 66 completed questionnaires, 56 respondents (85%) answered questions for both Coles and Woolworths, which provided 112 responses to the second part of the questionnaire (56 responses for Coles plus 56 responses for Woolworths), 6 and 4 respondents answered questions for Coles and Woolworths respectively (Table 5-1). Overall, 122 responses

were identified. After removing questionnaires with more than 10% missing data and imputing the questionnaires with less than 10% missing data (55 responses that include the options of ‘don't know’ and ‘not applicable’), 67 usable questionnaires were selected for further analysis. Although considering ‘don't know’ and ‘not applicable’ options as missing data decreased the number of responses, they increase the reliability of responses by not forcing the respondent to choose statements randomly (Dedrick & Greenbaum 2011; Houben 2017).

Table 5-1. Number of respondents

Focal firms	**Frequency**	**Percentage**
Both Coles and Woolworths	56	85%
Coles	6	9%
Woolworths	4	6%
Total	**66**	**100%**

5.3 Demography of the survey respondents

The demographic information collected from the survey can be useful in analysing the results from different perspectives. This research provides information about the profile of respondents with regards to their number of employees (by headcount), annual turnover, age (how many years they have been operating), and location (the country in which their firm's head office is located). These are important as selecting a particular type of RMS to encourage sustainability of the SCN in suppliers is not a simple process for focal firms, and can be affected by various contingency variables. In particular, suppliers in the SCN can be divided into different sizes (small, medium, and large) and years of operation. They may also have a different duration of relationship with their focal firms and be scattered geographically in the SCN.

Figure 5-1 presents the distribution of the firms based on the number of their employees. The results show that 40 firms (61%) have between 20 and 499 employees. In addition, the number of employees can be considered as a measure of the firm size (Mueller, Ouimet & Simintzi 2017). Based on the ABS definition (Clark et al. 2012), this research categorises firms as ‘small firms’ when they have less than 20 employees, ‘medium firms’ when they have employees between 20 and 199, and ‘large firms’

when they have more than 200 employees. In this regard, 7% of respondents (5 firms) are small firms, 43% (28 firms) are medium firms, and 50% (33 firms) are large firms.

The distribution of respondents is also analysed based on their firms' annual turnover to increase the credibility of the sample size. Figure 5-2 shows that the majority of firms (81%) have an annual turnover worth more than $10 million (AUD). Similar to the number of employees, annual turnover can be considered a sign of the firm size from the financial perspective (Nath & Ramanathan 2016). Based on the Australian Council of Learned Academies (Palangkaraya, Spurling & Webster 2014), firms can be characterised as a large firm when they have an annual turnover over $50 million (AUD). The result shows similar figures given that 45% of respondents (30 firms) are large firms (in comparison to the distribution of firms based on the number of employee).

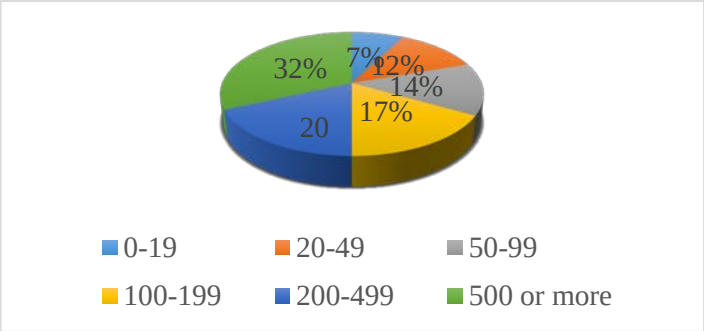

Figure 5-1. Distribution of the firms based based on the number of employees

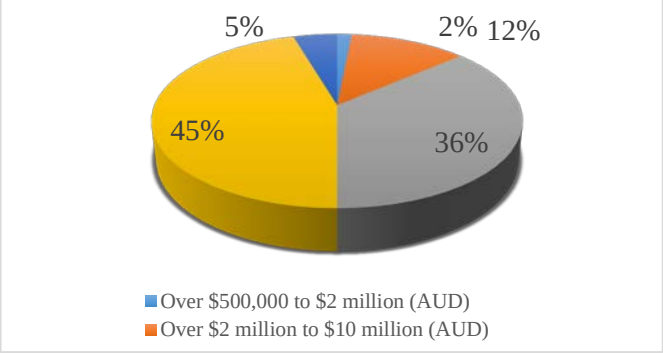

Figure 5-2. Distribution of the firms based on the annual turnover

To determine how many years that firms are operating in the market, this research collects data on their age. Firm age is also tied to firm performance, which may differ

between ‘young’ and ‘mature firms’ given their liability of newness (Lai et al. 2013). The age distinction can have either a negative impact or a positive impact on the adoption of sustainability practices (Hoogendoorn, Guerra & van der Zwan 2015). Accordingly, this research categorises suppliers into ‘young suppliers’ and ‘mature suppliers’ when they have been established less and more than 20 years respectively, as suggested by Mazzarol et al. (2010). The results indicate that that the majority of firms (70%) are ‘mature suppliers’ (46 firms), founded 20 or more years ago, while 20 firms (30%) are ‘young suppliers’, operating for 19 or fewer years (Figure 5-3).

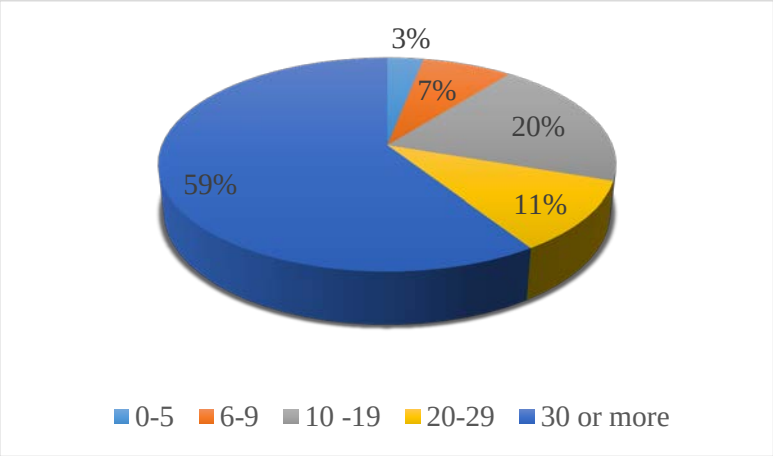

Figure 5-3. Distribution of the firms based on the years of operating

Regarding the location of firm headquarters, numerous studies have highlighted the impact of distance on the types of sustainability practices implemented by focal firms (Wilhelm et al. 2016; Meinlschmidt, Schleper & Foerstl 2018). The results indicate that the majority of respondents’ firm headquarters (82%, 54 firms) are located in Australia and 18% (12 firms) are located in foreign countries including New Zealand, the Philippines, Scotland, USA, Singapore, Japan, United Kingdom, and Italy. This distribution can assist in further analysis as conducted in Chapter Six to understand the impact of different categories of distance, geographical, organisational, and cultural discussed in Chapter Three on RMS.

As explained in Chapter Four, this research examines two retailers, Coles and Woolworths in the Australian food and grocery market. The results indicate that Fifty-

six out of 66 firms (85%) work with both Coles and Woolworths simultaniously while 6 firms (9%) work with Coles and 4 firms (6%) work with Woolworths. This creates a balance distribution between the number of suppliers in two SCNs. In addition, the number of medium firms and large firms in the sample size and the years of operating can provide useful information by differentiating between categories. Based on this information, the next sections measure and discuss the characteristics of the collected data.

5.3.1 Non-response bias test

The reliability of the research findings can be contaminated by the effect of non-response bias when the response rate is less than 100% (Shang & Lu 2012). To reduce the potential impact of non-response bias on further analysis, t-tests are conducted between two groups of early (n=36, 54%) and late (n=31, 46%) responses as suggested by Armstrong and Overton (1977). No significant differences between the two groups are found, which may imply that non-response bias is not a substantial issue in the collected data.

5.4 Exploratory factor analysis

To ensure the validity of the variables, which is also known as items, related to each construct, which is also known as factors, this research uses EFA. EFA provides an opportunity to categorise the observation within a structure without having an expectation of the structure of the outcome (Suhr 2006; Reio & Shuck 2015). Therefore, since all the constructs for the SCN structure and RMS (as presented in the conceptual framework in Chapter Three) are extracted from the literature, EFA has been used to validate the variables. Comparing and discussing the EFA results alongside the content analysis conducted for open-ended questions in the questionnaires may also help to identify the underlying latent constructs. According to numerous scholars (Gaskin & Happell 2014; Pallant 2013; Reio & Shuck 2015; Williams, Brown & Onsman 2013; Yong & Pearce 2013), before conducting factor analysis, five issues need to be considered including:

1. Determining the suitability of the data for the factor analysis

2. The extraction method
3. Deciding on the criteria for the extraction of factors
4. Choice of rotation method; and finally
5. Interpretation and labelling of the factors

Each of these issues is explored in the following subsections.

5.4.1 Data suitability for factor analysis

Generally, the literature presents varied views regarding the sample size required to perform EFA (Gaskin & Happell 2014; Hogarty et al. 2005; Reio & Shuck 2015; Watkins 2018). For example, Tabachnick and Fidell (2007) suggest that the sample size should be at least 300, while Hair et al. (2010) and Reio & Shuck (2015) recommend that factor analysis can be conducted with 100 or more cases. When providing a scale of suitability, Comrey and Lee (2013) suggest 100 as poor, 200 as fair, 300 as good, 500 as very good, and 1000 or more as excellent. This can be contrasted with, Sapnas and Zeller (2002) who suggest that 50 cases may be enough to conduct the analysis. Another suggestion is related to the sample to variable ratio, or N:P ratio where N refers to the sample size and P refers to the number of variables (Williams, Brown & Onsman 2013; Watkins 2018). The range can be 3:1, 6:1, 10:1, 15:1, or 20:1. However, Hogarty et al. (2005) argue that no minimum number for sample size is needed to obtain a good factor recovery, while Gaskin and Happell (2014) argue that the magnitudes of the communalities and the extent of overdetermination need to be considered to discern the minimum sample size. The normal distribution of all variables should be assessed before conducting the EFA (McDonald 2014; Watkins 2018). Meeting the normality assumption can be ensured by the value of skewness, between -3 and +3, as well as the value of the kurtosis, between +10 and +10 (Kline 2016). Another issue that needs to be considered in EFA is the factorability of the correlation matrix (Williams, Brown & Onsman 2013; Watkins 2018). A correlation matrix is used for correlation coefficients among variables. Hair et al. (2010) suggest +/- 0.3 as minimal, +/- 0.5 as important, and +/- 0.5 as the partially significant levels of acceptance. This indicates that factor analysis is not an appropriate statistical tool if no correlations among variables go beyond 0.3.

The Kaiser-Meyer-Olkin (KMO) test of sampling adequacy and Bartlett test of sphericity, however, indicates that the collected data is suitable for EFA (Williams, Brown & Onsman 2013; Watkins 2018). The KMO scores from 0 to 1 and Bartlett's test of sphericity with a significance level less than .05 ($p < 0.05$) are thus considered to be appropriate for EFA.

5.4.2 Factors extraction method

The factor extraction method recognises the number of constructs based on the similarity between the variables (Reio & Shuck 2015). This is important in EFA because if too few factors are identified, the researcher may lose some important relationships among the variables and if too many factors are extracted, some factors may not have salient loadings (Reise, Waller & Comrey 2000). Factors can be extracted in several ways (Reio & Shuck 2015): principal components analysis (PCA), principal axis factoring (PAF), image factoring, maximum likelihood, alpha factoring, unweighted least squares, and generalised least squares. However, among these extraction methods, PCA appears to be the most commonly used in the literature as it provides a clear factor structure in the EFA approach (Watkins 2018; Williams, Brown & Onsman 2010). PCA is the default method in many statistical software programs such as SPSS and is also considered a suitable method for establishing preliminary solutions in EFA (Williams, Brown & Onsman 2010). Therefore, PCA is considered in the further analysis.

5.4.3 Criteria used to determine factor extraction

Researchers can use several criteria to reduce the large number of items into factors (Williams, Brown & Onsman 2010). However, based on the nature of factor analysis, using a single criterion may not be adequate to run the factor extraction effectively. Thompson and Daniel (1996, p. 200) suggest that is more “appropriate and often desirable” to use multiple criteria to make a decision simultaneously. Hence, this research uses common criteria Kaiser’s criteria (eigenvalue > 1 rule) and the Scree test to extract the factors as they provide a clear distinction between extracted factors (Reio & Shuck 2015; Watkins 2018; Williams, Brown & Onsman 2010).

5.4.4 Selection of rotational method

Another consideration when conducting EFA is the relationship of the items to more than one factor (Watkins 2018). By maximising high item loadings and minimising low item loadings, a rotation can provide a more interpretable solution (Williams, Brown & Onsman 2010). This research uses orthogonal varimax rotation since this method provides the uncorrelated factor structure which is useful to differentiate between different factors (Rovai, Baker & Ponton 2013). The method is also recognised as the most common rotation technique in statistical programmes, which can provide better results to discern the underlying constructs being measured (Watkins 2018).

5.4.5 Interpretation

After attributing a set of items to a factor, it is important to provide the set with a name or theme as it can help reveal meaningful latent factors for both RMS and the SCN structure. Interpretation of the resulting factors assists researchers in reducing the number of items (Reio & Shuck 2015). To name a factor based on the meaningful interpretation, at least two or three items should be assigned to the factor. According to Henson and Roberts (2006, p. 396), "the meaningfulness of latent factors is ultimately dependent on researcher definition". As such, labelling the factors can assist researchers to capture the conceptual meaning of each item for defining the latent factors (Watkins 2018). Therefore, the labelling process can facilitate the interpretation of the results by operationalising the latent factors (Williams, Brown & Onsman 2010).

By ensuring the 'suitability of the data for factor analysis', EFA can be conducted through 'a correct factors extraction method', 'appropriate criteria to determine factor extraction', and 'a suitable rotational method', and the extracted factors will be named based on the 'meaningful interpretation'. These five issues of EFA are important as inappropriate decisions at any step could lead to errors of use and misinterpretation of the results (Reio & Shuck 2015). Following all five considerations, the empirical results of the EFA will be interpreted in the next section.

5.5 EFA result

Since this research collects data for items related to two different concepts, RMS and the SCN structure, two separate EFA processes are performed as each process extracts important factors which are related to each concept. The EFA results for RMS are discussed in section 5.5.1 and the EFA results for the SCN structure are discussed in section 5.5.2.

5.5.1 EFA for RMS

According to the issues discussed in section 5.4, before conducting the EFA, the suitability of the data is examined. The normality of the data for each item has been checked for skewness and kurtosis. The results in Table 5-2 show that all the items have values (statistic divided by standard error) between -3 and +3 for skewness and the values between -10 and +10 for kurtosis which is considered as a normal distribution (Kline 2016). In terms of correlation matrix, the collected data is considered suitable as the results (Appendix E) show that the majority of items have correlations of more than 0.3. In addition, as shown in Table 5-3, the KMO score > 0.6 and Chi-Square as a value of Bartlett's test of sphericity with a significance level less than .05 indicates that the data is suitable for EFA (Watkins 2018; Williams, Brown & Onsman 2010).

Table 5-2. Normality test for items related to RMS

Items	N	Mean	Std. deviation	Skewness			Kurtosis		
	Statistic	Statistic	Statistic	Statistic	Std. error	Value	Statistic	Std. error	Value
N1	67	3.254	1.709	0.511	0.293	1.745	-1.006	0.578	-1.741
N2	67	3.284	1.897	0.442	0.293	1.509	-1.184	0.578	-2.049
N3	67	3.075	1.663	0.977	0.293	3.338	0.072	0.578	0.125
T1	67	3.791	1.754	0.000	0.293	-0.001	-1.170	0.578	-2.025
T2	67	4.582	1.644	-0.519	0.293	-1.773	-0.862	0.578	-1.491
T3	67	4.119	1.665	-0.337	0.293	-1.151	-1.096	0.578	-1.897
D1	67	4.060	1.874	-0.089	0.293	-0.304	-1.338	0.578	-2.315
D2	67	4.269	1.806	-0.495	0.293	-1.692	-1.113	0.578	-1.926
D3	67	4.478	1.886	-0.460	0.293	-1.571	-1.217	0.578	-2.105

Table 5-2. Normality test for items related to RMS (continued)

Items	N	Mean	Std. deviation	Skewness			Kurtosis		
	Statistic	Statistic	Statistic	Statistic	Std. error	Value	Statistic	Std. error	Value
D4	67	4.269	1.888	-0.387	0.293	-1.323	-1.237	0.578	-2.140
D5	67	4.045	1.727	-0.362	0.293	-1.237	-1.127	0.578	-1.950
D6	67	3.000	1.557	0.645	0.293	2.204	-0.453	0.578	-0.784
D7	67	3.687	1.743	0.093	0.293	0.318	-1.162	0.578	-2.011
C1	67	3.508	1.837	0.252	0.293	0.861	-1.236	0.578	-2.138
C2	67	3.582	1.680	-0.018	0.293	-0.062	-1.210	0.578	-2.093
C3	67	3.164	1.746	0.445	0.293	1.519	-1.001	0.578	-1.731
C4	67	3.090	1.649	0.271	0.293	0.925	-1.149	0.578	-1.989
C5	67	3.045	1.512	0.274	0.293	0.937	-0.987	0.578	-1.708
C6	67	3.149	1.540	0.255	0.293	0.872	-0.930	0.578	-1.609

Table 5-3. KMO and Bartlett's test for items related to RMS

Kaiser-Meyer-Olkin measure of sampling adequacy.		0.809
Bartlett's test of sphericity	**Approx. Chi-Square**	894.052
	Df	171
	Sig.	0.000

After ensuring that the collected data is suitable for EFA, the initial run of the EFA has been conducted to extract factors related to RMS. As mentioned, two criteria (eigenvalue > 1 rule and the Scree test) are selected in the factor extraction process. Based on the information presented in Table 5-4, four factors had eigenvalues of more than 1, explaining 39.90%, 15.05%, 10.14%, and 6.68% of the total variance respectively, which also cover 71.77% of the cumulative variance. Figure 5-4 also shows a vivid breakpoint in the fourth factor.

Table 5-4. Total variance explained for items related to RMS

Component	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance (V)	Cumulative (C) %	Total	% of V	C%	Total	% of V	C %
1	7.581	39.898	39.898	7.581	39.898	39.898	4.674	24.599	24.599
2	2.859	15.049	54.946	2.859	15.049	54.946	4.459	23.470	48.069
3	1.926	10.138	65.084	1.926	10.138	65.084	2.572	13.536	61.605

Table 5-4. Total variance explained for items related to RMS (continued)

Component	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance (V)	Cumulative (C) %	Total	% of V	C%	Total	% of V	C %
4	1.269	6.681	71.765	1.269	6.681	71.765	1.930	10.160	71.765
5	0.854	4.494	76.259	-	-	-	-	-	-
6	0.733	3.857	80.116	-	-	-	-	-	-
7	0.654	3.443	83.560	-	-	-	-	-	-
8	0.486	2.556	86.116	-	-	-	-	-	-
9	0.442	2.325	88.441	-	-	-	-	-	-
10	0.438	2.305	90.746	-	-	-	-	-	-
11	0.357	1.878	92.624	-	-	-	-	-	-
12	0.296	1.558	94.181	-	-	-	-	-	-
13	0.281	1.477	95.658	-	-	-	-	-	-
14	0.210	1.104	96.763	-	-	-	-	-	-
15	0.187	0.982	97.745	-	-	-	-	-	-
16	0.156	0.820	98.565	-	-	-	-	-	-
17	0.111	0.582	99.147	-	-	-	-	-	-
18	0.101	0.532	99.679	-	-	-	-	-	-
19	0.061	0.321	100	-	-	-	-	-	-

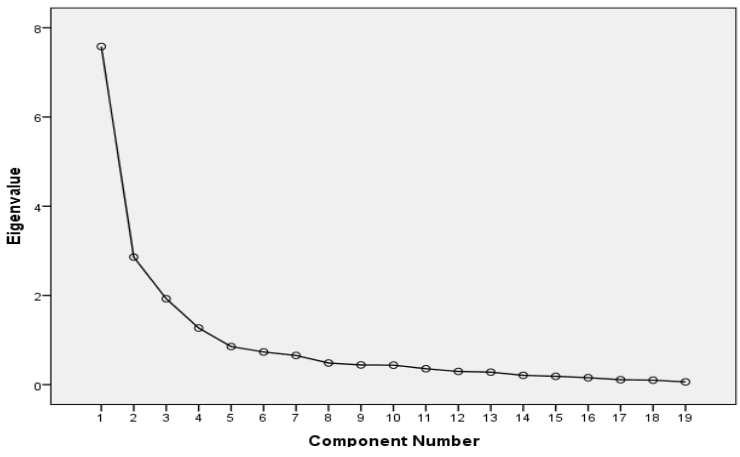

Figure 5-4. Scree plot for items related to RMS

To determine which items should be included or excluded from factors and also to retain factors, this research proceeded to do the following (Costello & Osborne 2005; Maskey, Fei & Nguyen 2018; Taherdoost, Sahibuddin & Jalaliyoon 2014):

- Retain items with moderate to high communalities (0.4 to 0.8 or greater)
- Retain items with a loading of more than 0.5
- Retain factors with three items or more

Regarding the communalities for items, the results in Table 5-5 show that except for D6, all the items had the value of 0.4 to 0.8 or greater. Thus, D6 is excluded from further analysis. As shown in Table 5-6, all the loading factors are more than 0.5 and given that at least three items related to each factor, all four factors are retained (all the items are analysed in one-go run).

Table 5-5. Communalities of items related to RMS

Item	Initial	Extraction
N1	1	0.743
N2	1	0.730
N3	1	0.643
T1	1	0.565
T2	1	0.695
T3	1	0.721
D1	1	0.707
D2	1	0.785
D3	1	0.627
D4	1	0.783
D5	1	0.822
D6	**1**	**0.338**
D7	1	0.720
C1	1	0.794
C2	1	0.772
C3	1	0.804
C4	1	0.839
C5	1	0.779
C6	1	0.768
Extraction method: principal component analysis.		

To test the reliability of the data, this research applied Cronbach's alpha coefficient as suggested by Bonett and Wright (2015) and Botella and Suero (2015). Results in Table 5-7 show 0.939, 0.903. 0.798, and 0.645 for the value of Cronbach's alpha in factor 1,

factor 2, factor 3, and factor 4 respectively, presenting that the identified factors have achieved a relatively high level of reliability. Although the obtained Cronbach's alpha for factor 4 is low by convention, it has been argued by a number of researchers that a Cronbach's alpha of at least 0.5 is sufficient (see for example, Bergquist & Nilsson 2016; Dhliwayo & Nyanumba 2014). Table 5-7 also provides a label for each factor. In the labelling process, this research used the appropriate name to reflect the conceptual and theoretical intent (Williams, Brown & Onsman 2013).

Table 5-6. Rotated component matrix[a] for items related to RMS

Items	Component			
	1	2	3	4
C1	0.792			
C2	0.816			
C3	0.843			
C4	0.847			
C5	0.831			
C6	0.858			
D1		0.791		
D2		0.810		
D3		0.750		
D4		0.806		
D5		0.873		
D7		0.830		
N1			0.817	
N2			0.775	
N3			0.778	
T1				0.729
T2				0.703
T3				0.795

Extraction method: principal component analysis.
Rotation method: Varimax with Kaiser normalisation.
a. Rotation converged in 5 iterations.

The first factor is named ‘collaborative RMS’. The reason for choosing this name is based on the 6 items (C1, C2, C3, C4, C5, and C6) that are listed in this factor. As shown in Table 5-7, all six items are related to the way that the focal firms tend to

collaborate with their suppliers. The collaborative RMS accounted for 39.90% of the total variance and C6 ('Coles/Woolworths directly involves us in various practices related to sustainability issues') had the highest loading factor (0.858) among other items.

Table 5-7. Labelling items related to RMS

Factor	Label	Initial	Items	Loading	Cronbach's alpha
1	Collaborative	C1	Coles collaborates with us in setting goals regarding sustainability issues.	0.792	0.939
		C2	There is a close cooperation between our firm and Coles in implementing sustainability practices.	0.816	
		C3	Coles provides education to our personnel to improve their knowledge in managing sustainability issues.	0.843	
		C4	Coles provides assistance to our personnel to improve their knowledge and skills in managing sustainability issues.	0.847	
		C5	There are many joint activities between Coles and our firm to manage sustainability issues.	0.831	
		C6	Coles directly involves us in various practices related to sustainability issues.	0.858	
2	Dictatorial	D1	Coles audits our sustainability practices by its own auditors.	0.791	0.903
		D2	Coles audits our sustainability practices regularly.	0.810	
		D3	Coles is able to terminate the relationship with us in the case of non-compliance with sustainability standards (such as codes of conduct).	0.750	
		D4	Coles urges us to follow its own sustainability standards.	0.806	
		D5	Coles imposes sustainability standards on our firm.	0.873	
		D7	Coles urges us to initiate sustainability practices irrespective of our constraints.	0.830	
3	Non-compliance	N1	Coles/Woolworths has no interest in addressing sustainability issues (such as water conservation, recycling, workforce right) of our firm's practices.	0.817	0.798
		N2	We do not need to report our sustainability practices to Coles/Woolworths or its representatives.	0.775	
		N3	Our sustainability practices are valuable for Coles /Woolworths.	0.778	
4	Transactional	TR1	Coles/Woolworths only asks us to meet minimum requirements of sustainability issues.	0.729	0.645
		TR2	Coles uses external sources such as its suppliers, or other third parties to audit or evaluate our sustainability practices	0.703	
		TR3	We have a low level of information sharing with Coles/Woolworths in terms of sustainability practices.	0.795	

The second factor, comprising six items (D1, D2, D3, D4, D5, and D7), is called ‘dictatorial RMS’. This name is selected as all items placed in this factor showed the tendency that the focal firms dictate their desires on their suppliers. The dictatorial RMS covered 15.05% of the total variance, having D5 (‘Coles/Woolworths imposes sustainability standards on our firm’) with the highest loading factor (0.873).

The third factor is named ‘non-compliance RMS’. This name is selected as all three items associated with this factor show that the focal firms are not interested in following the sustainability practices of their suppliers. The non-compliance RMS accounted for 10.14% of the total variance with N1 (‘Coles/Woolworths has no interest in addressing sustainability issues such as water conservation, recycling, workforce right of our firm’s practices’) having the highest loading factor (0.817). Finally, the fourth factor is named ‘transactional RMS’, which had the least share (6.68%) of the total variance. The reason for selecting this name is that all three items (TR1, TR2, and TR3) in this factor focused on the arms-length type of relationship between the focal firms and suppliers. This means that the focal firms in this RMS had minimal motivation to follow the sustainability concerns of their suppliers. Among the items, TR3 (‘we have a low level of information sharing with Coles/Woolworths in terms of sustainability practices’) had the highest loading factor (0.795), which indicates the highest contribution value for the fourth factor.

By identifying and labelling these four factors, this research reduces the number of items which are associated with RMS and conducts further analysis by using these four factors. This step is crucial in the extraction process, assigning a number of items to specific factors and facilitating the interpretation of results.

5.5.2 EFA for the SCN structure

After extracting four factors for RMS, this section explores EFA for the SCN structure. All items relating to the SCN structure are subjected to the same EFA process reported in the previous section on EFA for RMS. To check the suitability of the data, normality tests are conducted for all SCN structure items. The results in Table 5-8 indicate that the data for the majority of items are normally distributed and acceptable for EFA,

ranging between the values between -3 and +3 for skewness and the values between -10 and +10 for kurtosis (Kline 2016). The correlation matrix is also presented in Appendix F. According to the matrix, there are several items which have correlations greater than 0.3, indicating the suitability of the data for performing the factor analysis. The KMO scores above 0.6 and the significance levels greater than 0.05 for Bartlett's test of sphericity (Table 5-9) also indicate no concern in conducting further analysis (Hair et al. 2010; Maskey, Fei & Nguyen 2018). Therefore, these results validate the use of EFA for the items related to the SCN structure.

Table 5-8. Normality test for items related to the SCN structure

Item	N	Mean	Std. deviation	Skewness			Kurtosis		
	Statistic	Statistic	Statistic	Statistic	Std. error	Value	Statistic	Std. error	Value
T1	67	5.582	1.103	-0.773	0.293	-2.640	0.522	0.578	0.903
T2	67	5.149	1.726	-0.676	0.293	-2.307	-0.909	0.578	-1.573
T3	67	5.179	1.576	-0.688	0.293	-2.351	-0.573	0.578	-0.991
T4	67	5.284	1.300	-0.763	0.293	-2.607	0.088	0.578	0.153
T5	67	6.299	0.718	-0.517	0.293	-1.766	-0.900	0.578	-1.557
EP6	67	5.299	1.101	-1.116	0.293	-3.812	1.200	0.578	2.076
EP7	67	5.418	1.220	-1.273	0.293	-4.346	1.441	0.578	2.493
RefP8	67	5.702	0.853	-0.584	0.293	-1.994	-0.131	0.578	-0.226
RefP9	67	5.657	0.827	-0.935	0.293	-3.194	1.041	0.578	1.801
LP10	67	5.000	1.128	-0.653	0.293	-2.229	0.424	0.578	0.733
LP11	67	4.716	1.631	-0.562	0.293	-1.918	-0.969	0.578	-1.677
RewP12	67	4.224	1.465	-0.253	0.293	-0.863	-0.750	0.578	-1.297
RewP13	67	4.731	1.226	-0.838	0.293	-2.860	-0.035	0.578	-0.061
CP14	67	3.224	1.506	0.017	0.293	0.058	-1.293	0.578	-2.238
CP15	67	3.299	1.741	0.572	0.293	1.952	-0.627	0.578	-1.084
SD16	67	4.597	1.907	-0.275	0.293	-0.940	-1.278	0.578	-2.212
SD17	67	5.224	1.603	-0.810	0.293	-2.766	-0.335	0.578	-0.580
SD18	67	4.985	1.522	-0.664	0.293	-2.269	-0.251	0.578	-0.434
SD19	67	5.030	1.517	-0.642	0.293	-2.193	-0.585	0.578	-1.013
SD20	67	5.149	1.530	-0.573	0.293	-1.957	-0.605	0.578	-1.046
SD21	67	5.433	1.598	-0.816	0.293	-2.788	-0.425	0.578	-0.735
FD22	67	4.328	1.709	-0.289	0.293	-0.986	-0.870	0.578	-1.505
FD23	67	4.000	1.679	0.099	0.293	0.338	-0.973	0.578	-1.683
FD24	67	3.537	1.803	0.329	0.293	1.124	-0.959	0.578	-1.660
PD25	67	3.866	1.696	0.236	0.293	0.805	-0.914	0.578	-1.581
PD26	67	3.433	1.510	0.473	0.293	1.615	-0.832	0.578	-1.440
OD27	67	3.194	1.579	0.384	0.293	1.312	-1.072	0.578	-1.854
OD28	67	3.239	1.518	0.170	0.293	0.580	-1.358	0.578	-2.350
CD29	67	3.985	1.710	-0.145	0.293	-0.494	-0.979	0.578	-1.694
CD30	67	3.299	1.633	0.425	0.293	1.452	-0.832	0.578	-1.440

Table 5-9. KMO and Bartlett's test for items related to the SCN structure

Kaiser-Meyer-Olkin measure of sampling adequacy		0.664
Bartlett's test of sphericity	**Approx. Chi-Square**	1191.364
	df	325
	Sig.	0.000

5.5.2.1 Initial result

After the suitability of the data is checked, the initial run of the EFA (PCA with Orthogonal Varimax rotation using SPSS v 21) is conducted for the SCN structure. Similar to the process of EFA for RMS, two criteria (eigenvalue > 1 rule and the Scree test) are applied to the factor extraction process. Based on the information in Table 5-10, eight factors had eigenvalue more than 1, explaining 20.13%, 15.58%, 11.11%, 9.39%, 6.21%, 5.20%, 4.76%, and 3.90% of the total variance. However, regarding the Scree test, a clear break is noticed across 6 factors in Figure 5-5, which emphasised the presence of six factors in the extraction process.

The same guidelines (section 5.5.1) to run EFA for RMS are used to extract factors and related items of the SCN structure. Accordingly, T5, EP6, CP14, and CD29 are excluded from further analysis as they had loading factors less than 0.5 and also did not show a fixed place in related factors. Thus, while interpreting the final results, these items are removed and the remaining items are categorised into latent factors.

5.5.2.2 Final result

Considering the six factors identified in the Scree test and cumulative eigenvalues, another round of EFA is conducted. As shown in Table 5-11, the six identified factors explain 72.05% of the cumulative variance which is considered satisfactory (Jamil et al. 2018; Rovai, Baker & Ponton 2013; Williams, Brown & Onsman 2013). The first factor explained 22.52%, the second factor covered 15.83%, the third factor contributed 11.52%, the fourth factor accounted 10.00%, the fifth factor covered 6.91%, and the six-factor explained 5.25% of the total variance. Table 5-12 shows the final result of the EFA for items related to the SCN structure, which categorises all items in the related factors (all the items are analysed in one-go run). To check the

reliability of items within the intended factors, Cronbach's alpha test is conducted. Table 5-13 presents the results and also provides a label for each selected factor in the extraction process.

Table 5-10. Total variance for items related to the SCN structure (first round)

Component	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance (V)	Cumulative (C) %	Total	% of V	C %	Total	% of V	C %
1	6.039	20.129	20.129	6.039	20.129	20.129	5.150	17.177	17.177
2	4.674	15.581	35.709	4.674	15.581	35.709	3.270	10.914	28.091
3	3.334	11.114	46.824	3.334	11.114	46.824	3.130	10.445	38.536
4	2.818	9.394	56.218	2.818	9.394	56.218	3.010	10.015	48.551
5	1.862	6.206	62.424	1.862	6.206	62.424	2.870	9.569	58.120
6	1.561	5.204	67.629	1.561	5.204	67.629	2.170	7.247	65.367
7	1.429	4.764	72.392	1.429	4.764	72.392	1.690	5.640	71.007
8	1.170	3.899	76.291	1.170	3.899	76.291	1.590	5.284	76.291
9	0.948	3.161	79.452	-	-	-	-	-	-
10	0.920	3.067	82.518	-	-	-	-	-	-
11	0.722	2.405	84.924	-	-	-	-	-	-
12	0.593	1.975	86.899	-	-	-	-	-	-
13	0.538	1.793	88.692	-	-	-	-	-	-
14	0.460	1.533	90.226	-	-	-	-	-	-
15	0.453	1.511	91.737	-	-	-	-	-	-
16	0.364	1.212	92.949	-	-	-	-	-	-
17	0.314	1.045	93.994	-	-	-	-	-	-
18	0.279	0.930	94.924	-	-	-	-	-	-
19	0.255	0.851	95.774	-	-	-	-	-	-
20	0.200	0.666	96.440	-	-	-	-	-	-
21	0.183	0.609	97.048	-	-	-	-	-	-
22	0.169	0.563	97.611	-	-	-	-	-	-
23	0.149	0.498	98.110	-	-	-	-	-	-
24	0.134	0.447	98.556	-	-	-	-	-	-
25	0.119	0.397	98.953	-	-	-	-	-	-
26	0.099	0.330	99.283	-	-	-	-	-	-
27	0.082	0.274	99.558	-	-	-	-	-	-
28	0.070	0.232	99.789	-	-	-	-	-	-
29	0.047	0.158	99.947	-	-	-	-	-	-
30	0.016	0.053	100	-	-	-	-	-	-

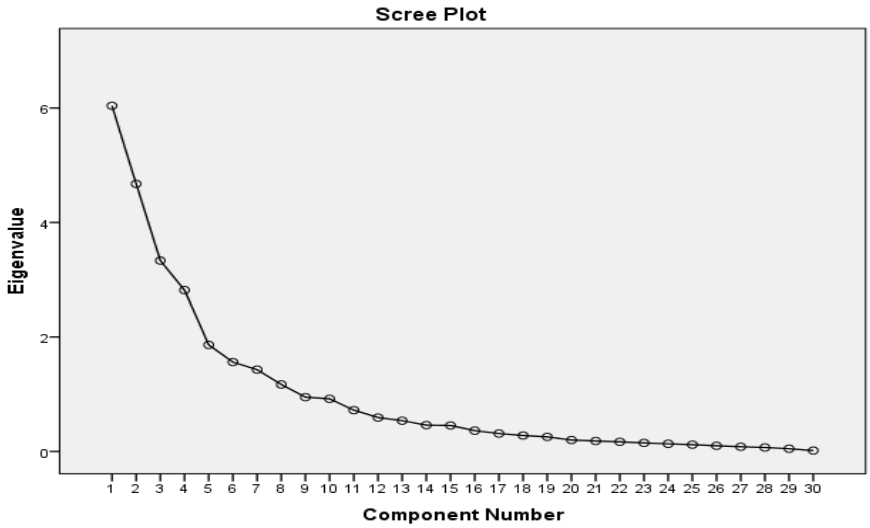

Figure 5-5. Scree plot for items related to the SCN structure

Table 5-11. Total variance for items related to the SCN structure (second round)

Component	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance (V)	Cumulative (C) %	Total	% of V	C %	Total	% of V	C %
1	5.856	22.523	22.523	5.856	22.523	22.523	4.957	19.065	19.065
2	4.116	15.831	38.354	4.116	15.831	38.354	3.512	13.508	32.574
3	2.995	11.520	49.873	2.995	11.520	49.873	2.961	11.388	43.962
4	2.601	10.002	59.876	2.601	10.002	59.876	2.723	10.473	54.435
5	1.799	6.921	66.797	1.799	6.921	66.797	2.524	9.706	64.141
6	1.365	5.250	72.046	1.365	5.250	72.046	2.055	7.905	72.046
7	1.150	4.422	76.468	-	-	-	-	-	-
8	0.827	3.182	79.650	-	-	-	-	-	-
9	0.734	2.824	82.474	-	-	-	-	-	-

Table 5-12. Rotated component matrix[a] for items related to the SCN structure

Item	Component					
	1	2	3	4	5	6
SD16	0.813					
SD17	0.885					
SD18	0.857					
SD19	0.883					
SD20	0.922					
SD21	0.747					
T1		0.772				
T2		0.853				
T3		0.711				
T4		0.802				
LP10		0.589				
LP11		0.572				
PD25			0.827			
PD26			0.770			
OD27			0.663			
OD28			0.782			
CD30			0.606			
FD22				0.803		
FD23				0.827		
FD24				0.844		
EP7					0.790	
RefP8					0.798	
RefP9					0.856	
RewP12						0.662
RewP13						0.859
CP15						0.745

Extraction method: principal component analysis.
Rotation method: Varimax with Kaiser normalisation.
a: Rotation converged in 7 iterations

Table 5-13. Labelling items related to the SCN structure

Factor	Label	Initial	Items	Loading	Cronbach's alpha
1	Supplier dependency	SD16	We have difficulties making our business work if we decide to stop working with Coles/Woolworths.	0.813	0.933
		SD17	It would take a long time to replace Coles/Woolworths with new retailers.	0.885	
		SD18	We find it very costly to replace Coles/Woolworths with new retailers.	0.857	
		SD19	Our sales significantly decrease if Coles does not sell our products well.	0.883	
		SD20	Our sales significantly decrease if Coles/Woolworths does not buy our products any longer.	0.922	
		SD21	Having a good relationship with Coles/Woolworths is critical in our overall business.	0.747	
2	Transparency	T1	Firms in our business network know how our products are produced	0.772	0.845
		T2	Firms in our business network can track our products from raw materials to the end customers.	0.853	
		T3	Firms in our business network can find information about our suppliers.	0.711	
		T4	Firms in our business network know about the types of raw materials/components in our products.	0.802	
		LP10	Firms in our business network comply with our requests, even if there is no contract between us	0.589	
		LP11	We expect firms in our business network to accommodate our request, even if there is no contract between us	0.572	
3	Distance	PD25	It takes too much time to schedule a face-to-face meeting with Coles/Woolworths.	0.827	0.813
		PD26	We find it very costly to hold a face-to-face meeting with Coles/Woolworths.	0.770	
		OD27	We do not exchange critical information about our products with Coles/Woolworths.	0.663	
		OD28	Exchanging information about our products with Coles/Woolworths is difficult.	0.782	
		CD30	The communication tools we use are different to Coles/Woolworths.	0.606	
4	Buyer dependency	FD22	If we do not sell our products to Coles/Woolworths, they find it difficult to substitute our products.	0.803	0.879
		FD23	It would be difficult for Coles/Woolworths to stop working with us.	0.827	
		FD24	Coles/Woolworths do not have alternatives to our products.	0.844	
5	RE power	EP7	Firms in our business network find the knowledge of our experts about their products/services valuable.	0.790	0.799
		REFP8	Firms in our business network are proud to be closely associated with us.	0.798	
		REFP9	Firms in our business network admire us as an attractive reputational resource.	0.856	
6	RC power	REWP12	We can offer incentives to firms in our business network so they comply with our requests.	0.662	0.655
		REWP13	Firms in our business network cooperate in implementing a new practice if we provide incentives.	0.859	
		CP15	We are not treating firms in our business network very well if they do not accept our requests.	0.745	

As shown in Table 5-13, the first factor is named ‘supplier dependency’ as all items associated with this factor focused on the way that suppliers can be dependent on the focal firms. This factor included six items (SD16, SD17, SD18, SD19, SD20, and SD21) and accounted for 22.52% of the total variance. SD20 (‘our sales significantly decrease if Coles/Woolworths does not buy our products any longer’) had the highest loading factor of 0.922. By showing 0.933 at Cronbach’s alpha in the reliability test, the six items presented a high level of reliability in measuring ‘supplier dependency’.

After analysing all items associated with the second factor, ‘transparency’ is selected as the name. Transparency included six items (T1, T2, T3, T4, LP10, and LP11) and explained 15.83% of the total variance. Among all items, T2 (‘firms in our business network can track our products from raw materials to the end customers’) had the highest loading factor (0.853). Cronbach’s alpha is 0.845 indicating a high level of reliability achieved by the six items.

The third factor is named ‘distance’. The main reason for selecting this name is that all items focused on how great an effort the focal firms need to make to interact with their suppliers. This factor included five items (PD25, PD26, OD27, OD28, and OD30) and accounted for 11.52% of the total variance. PD25 (‘it takes too much time to schedule a face-to-face meeting with Coles/Woolworths’) had the highest loading factor (0.827). Having a high level of reliability in Cronbach’s alpha test (0.813) indicated that all five items properly measure the intended factor.

Based on the nature of the related items, the fourth factor is named ‘buyer dependency’. In comparison to ‘supplier dependency’, all three items (FD22, FD23, FD24) focused on the influence that the suppliers have on the focal firms. This factor explained 10.00% of the total variance, with FD24 (‘Coles/Woolworths do not have alternatives to our products’) holding the highest loading factor (0.844). Furthermore, Cronbach’s alpha test (0.879) indicated a high level of reliability for all three items measuring this factor.

The fifth factor is named ‘RE’ power, which is the combination of items for the ‘reference power’ and ‘expert power’ identified in the literature (section 3.5.1.3). Three items (EP7, REFP8, and REFP9) associated with this factor account for 6.92% of the total variance. REFP9 (‘firms in our business network admire us as an attractive reputational resource’) had the highest loading factor (0.856). A Cronbach’s alpha test is performed, with the result (0.799) indicating a high level of reliability for measuring this factor.

Finally, the sixth factor is named ‘RC’ power, mixing items for the ‘reward power’ and ‘coercive power’ identified in the literature (section 3.5.1.3). Three items (REWP12, REWP13, and CP15) are associated with this factor achieving 0.655 in a Cronbach’s alpha test which indicated a relatively high level of reliability for measuring this factor. RC power explained 5.25% of the total variance, with REWP13 (‘firms in our business network cooperate in implementing a new practice if we provide incentives’) holding the highest loading factor (0.859).

The identified factors and all the items associated with each factor provided a sufficient validity to the classification of constructs for the RMS and the SCN structure that this research suggested in Chapter Three. Factor loadings and items associated with each factor have been used as the main strategy to label each factor. In the next two sections, the findings will be discussed based on the results of the survey and the literature review. Section 5.5.3 discusses the final EFA results for RMS and then section 5.5.4 discusses the final EFA results for the SCN structure.

5.5.3 RMS discussion based on the EFA

Based on the EFA results in Table 5-6, four RMS have been identified and are discussed below. These RMS (their priority based on their share in total variances) include:

1) Collaborative RMS
2) Dictatorial RMS
3) Non-compliance RMS
4) Transactional RMS

These RMS help focal firms to manage sustainability issues in their SCN actors within their SCN.

5.5.3.1 Collaborative RMS

The items (outlined in Table 5-7) in this factor are extracted from question 15 (questions for Coles) and question 24 (questions for Woolworths) of the web-based questionnaire (Appendix A), which concentrate on the collaborative approach that focal firms have towards their SCN actors. The first ranked item in the loading factor (0.858) is related to 'involving directly in various projects to manage sustainability issues' ('Coles/Woolworths directly involves us in various practices related to sustainability issues'). This indicates that focal firms usually ask for the involvement of their SCN actors in projects aimed at to improving sustainability performance. According to past studies (see Beske & Seuring 2014), suppliers' early involvement in new product development or collaborative planning, forecasting and replenishment (CPFR) projects can be linked to sustainability practices in the pursuit of sustainability. Focal firms may encourage their SCN actors to participate in programs related to sustainability issues.

The second and third highest ranking positions of the loading factors (0.847 and 0.843 respectively) are associated with 'educating and providing assistance to improve knowledge and skills' ('Coles/Woolworths provides assistance to our personnel to improve their knowledge and skills in managing sustainability issues' and 'Coles/Woolworths provides education to our personnel to improve their knowledge in managing sustainability issues' respectively). These items have been indicated in other studies including:

- Training and education of suppliers' personnel to improve social and environmental conditions (Alwan, Jones & Holgate 2017; Harms, Hansen & Schaltegger 2013)
- Assisting first-tier suppliers on how to manage sustainability issues with their own suppliers (Meinlschmidt, Schleper & Foerstl 2018; Tachizawa & Wong 2014)

- Collaborating with suppliers to educate the general public on sustainability issues (Domingues et al. 2017; MacCarthy & Jayarathne 2012)

The fourth and fifth ranked items in the loading factors are related to ‘joint activities and close cooperation’ (‘there are many joint activities between Coles/Woolworths and our firm to manage sustainability issues’ (0,831) and ‘there is a close cooperation between our firm and Coles/Woolworths in implementing sustainability practices’ (0.816)). Responses to these items are consistent with the literature (Ciccullo et al. 2017; Vurro, Russo & Perrini 2009), finding that focal firms provide opportunities in which their SCN actors can count on them in running different projects such as developing an environmental management system. In this way, the SCN actors believe that their focal firms consider a win-win situation regarding their business values.

In addition, SCN actors may be more interested in having a cooperative approach with focal firms to facilitate mutual understanding and collaboration. For example, by developing a joint venture, SCN actors can form multiple and simultaneous linkages with their focal firms to achieve the joint benefits (Polidoro, Ahuja & Mitchell 2011). Similarly, based on the qualitative responses to one open-ended question (‘aside from existing sustainability practices in your firm, what other practices do you think Coles can initiate to improve sustainability in your firm that would be beneficial for both firms?’), this research finds that suppliers may have a positive view of the joint venture approach with their retailers, which emphasises the role of collaborative RMS to improve sustainability of the SCN.

The sixth ranked item in the loading factors is related to ‘setting goals regarding sustainability issues’ (‘Coles collaborates with us in setting goals regarding sustainability issues’ (0.792)). This item indicates that focal firms and their SCN actors need to have a mutual willingness to exchange information regarding their operation and setting goals to improve their sustainability performance. Thus, by developing their close cooperation, focal firms can add more sustainability to their SCN, which can be beneficial for each participant.

5.5.3.2 Dictatorial RMS

Six items for the dictatorial RMS are derived from question 15 (questions for Coles) and question 24 (questions for Woolworths) of the web-based questionnaire. As mentioned, in all items related to this factor, focal firms have a tendency to dictate that their SCN actors address certain sustainability issues. The first ranked item in the loading factors (0.873) focuses on 'imposing sustainability standards' within the SCN actors ('Coles/Woolworths imposes sustainability standards on our firm'). This item highlights that focal firms create standards and ask their SCN actors to respect these standards. For example, by developing KPIs, focal firms may ask their SCN actors to strictly follow their instructions to manage sustainability issues (Pinna 2018).

The forceful attitude can also be supported by the second ranked item in the loading factors (0.83) which is related to 'urging SCN actors to initiate sustainability practices' ('Coles/Woolworths urges us to initiate sustainability practices irrespective of our constraints'). This means that focal firms do not consider the constraints and limitations that their SCN actors may encounter while implementing sustainability practices. For example, focal firms may mandate their SCN actors to use recyclable packaging (Rajabian Tabesh, Batt & Butler 2016). Some SCN actors may implement advanced-IT tools such as electronic data interchange (EDI) to facilitate the process of implementing sustainability practices requested by their focal firms (Han & Dong 2017). The third and fifth ranked item in the loading factors (0.81 and 0.791 respectively) are associated with 'sustainability practices auditing' ('Coles/Woolworths audits our sustainability practices regularly' and 'Coles/Woolworths audits our sustainability practices by its own auditors' respectively). These items show that focal firms tend to monitor and control the implementation of sustainability practices within the SCN actors. In this way, the focal firms audit the performance of suppliers regularly which can help them to manage sustainability issues. This research found that the focal firms may use their own resources to audit the sustainability practices implemented by the SCN actors. Furthermore, focal firms may also develop their own software and programs to follow the sustainability performance of their SCN actors.

The fourth ranked item in the loading factors (0.806) is related to the way that focal firms 'dictate their own sustainability standards' ('Coles/Woolworths urges us to follow its own sustainability standards'). This item indicates that focal firms demand that their sustainability standards are followed by their SCN actors. As found by Parmigiani, Klassen and Russo (2011), the standards may not be required by the regulations, but the focal firms tend to be proactive in managing these sustainability issues. This attitude may be considered a one-way negotiation by the SCN actors.

The sixth ranked item in the loading factors (0.75) is associated with 'terminating the relationship' when SCN actors do not follow the sustainability standard ('Coles/Woolworths is able to terminate the relationship with us in the case of non-compliance with sustainability standards (such as codes of conduct)'). Drawing on past research (Delmas & Montiel 2009; Pullman et al. 2017), this item indicates that focal firms view non-compliance with sustainability standards as a critical issue. In the most extreme case, this negative outcome can be accompanied by the termination of the business relationship. This attitude is seen as a way that the focal firms find a win-lose situation in their relationship with the SCN actors.

5.5.3.3 Non-compliance RMS

Items for the non-compliance RMS are extracted from question 15 (questions for Coles) and question 24 (questions for Woolworths) of the web-based questionnaire. All the items related to the non-compliance RMS show that focal firms are not interested in participating in the sustainability management process within the SCN actors. The first ranked item in the loading factors (0.817) is associated with 'showing no interest' by focal firms to involve in sustainability practices performed by their SCN actors ('Coles/Woolworths has no interest in addressing sustainability issues [such as water conservation, recycling, workforce right] of our firm's practices'). This can be considered as the lowest level in addressing the requirements of sustainability issues. Focal firms have this attitude towards SCN actors because the SCN actors' poor performance in sustainability may have no influence on the focal firms' sustainability performance. In addition, since investing in sustainability practices may

turn out to be costly, the focal firms do not apply their own resources to each SCN actor as they would in the collaborative approach.

The second ranked item in the loading factors (0.778) is related to the 'valued that focal firms place on sustainability practice' implemented by the SCN actors ('our sustainability practices are valuable for Coles/Woolworths'). This item indicates that the results coming from sustainability practices in the SCN actors are not seen valuable by focal firms; namely, such practices may not affect their performance. This means, although the SCN actors may provide the focal firms with their sustainability practices results, the focal firms may not be interested in communicating with them.

The third ranked item in the loading factors (0.775) is associated with the 'necessity to report the sustainability practices' to the focal firms ('we do not need to report our sustainability practices to Coles/Woolworths or its representatives). This indicates that the SCN actors are not expected to report their sustainability performance to their focal firms due to the firms' lack of interest. This means, some SCN actors may disregard the reluctance of their focal firms in addressing sustainability issues and, understanding the future benefits of sustainability practices, have begun to implement their own.

5.5.3.4 Transactional RMS

There are three items for transactional RMS, which are from question 15 (questions for Coles) and question 24 (questions for Woolworths) of the web-based questionnaire. The main focus in these items is on using 'arm's-length interactions' by focal firms to manage sustainability issues within their SCN actors. The first ranked item in the loading factors (0.795) is associated with 'information exchange' ('we have a low level of information sharing with Coles/Woolworths in terms of sustainability practices'). This item indicates that focal firms have a tendency to keep a distance from their SCN actors in sharing information. In this regard, there is a low level of communication in terms of sustainability between focal firms and their SCN actors.

The second ranked item in the loading factors (0.729) is associated with 'monitoring minimum requirement of sustainability issues' by focal firms ('Coles/Woolworths

only asks us to meet minimum requirements of sustainability issues'). To reduce the transaction cost, the focal firms may be satisfied with following the least acceptable amount of effort implemented by the SCN actors to manage sustainability issues. For example, the SCN actors can fulfil their focal firms' expectations if they meet only the minimum requirements of working conditions and employees' remuneration (MacCarthy & Jayarathne 2012). The third ranked item in the loading factors (0.703) is related to using third parties to audit sustainability practices ('Coles/Woolworths uses external sources such as its suppliers, or other third parties to audit or evaluate our sustainability practices'). Another way to reduce the transaction cost is to transfer this responsibility to a third party. By using third parties, focal firms can ensure that the sustainability practices of their SCN actors are under control and transaction cost may be reduced. For example, delegating monitoring responsibilities and using external service providers (such as standards institutions, auditors) to audit suppliers are ways to gain information regarding sustainability issues in the SCN actors (Meinlschmidt, Schleper & Foerstl 2018).

5.5.4 The SCN structure discussion based on the EFA

As illustrated in Table 5-12, the EFA results for the SCN structure identify six factors (the priority is based on their share in total variances) which will be discussed in the following subsections:

1) Supplier dependency
2) Transparency
3) Distance
4) Buyer dependency
5) RE power
6) RC power

Using these factors can assist focal firms to conceptualise their SCN structure to make informed decisions regarding sustainability issues in their SCN.

5.5.4.1 Supplier dependency

All six items related to supplier dependency are from question 11 (questions for Coles) and question 20 (questions for Woolworths) of the web-based questionnaire. These items focused on the extent that SCN actors are dependent on their focal firms. The first and third ranked items in the loading factors (0.922 and 0.883 respectively) are related to 'the proportion of SCN actors' sales volume provided by their focal firms' ('our sales significantly decrease if Coles/Woolworths does not buy our products any longer' and 'our sales significantly decrease if Coles does not sell our products well'). Similar to past research (Kim & Henderson 2015; Yeniyurt, Henke & Yalcinkaya 2014), these items indicate that analysing the proportion of SCN actors' total sales made through focal firms can affect the degree to which the SCN actor depends on their focal firms.

The second and fourth ranked items in the loading factors (0.885 and 0.857 respectively) are related to 'the degree of efforts that it takes to replace the focal firm ('it would take a long time to replace Coles/Woolworths with new retailers' and 'we find it very costly to replace Coles/Woolworths with new retailers'). These items concentrate on the time and the cost that SCN actors spend finding an alternative for their focal firms. Having other options in the market can decrease the dependency of the SCN actors on their focal firms (Kim & Wemmerlöv 2015; Tanskanen 2015). In this respect, if the focal firm has a high market share, it would require immense effort for SCN actors to equally replace it.

The fifth ranked item in the loading factors (0.813) is associated with 'the difficulties which stem from terminating the relationship with focal firms' ('we have difficulties making our business work if we decide to stop working with Coles/Woolworths'). Aside from the time and cost that it takes to cease work with focal firms, SCN actors need to make a decision about how this termination can affect their total business. Therefore, if this process involves many difficulties, the SCN actor can be considered dependent on its focal firm (Hoejmose & Adrien-Kirby 2012).

The sixth ranked item in the loading factors (0.747) is related to 'the importance of having a relationship with focal firms' ('having a good relationship with Coles/Woolworths is critical in our overall business'). Establishing a good relationship has always been a major issue for SCN actors (Touboulic, Chicksand & Walker 2014). As the focal firm can play a significant role in the SCN actors' total business, finding an appropriate type of relationship with the focal firm can also affect their competitiveness. Thus, creating good relationships with focal firms can be beneficial for dependent SCN actors.

5.5.4.2 Transparency

All six items associated with measuring transparency are derived from question 6 of the web-based questionnaire. The first, second, and third ranked item in the loading factors (0.853, 0.802, and 0.772 respectively) are related to 'gaining information about products by SCN actors' ('firms in our business network can track our products from raw materials to the end customers', 'firms in our business network know about the types of raw materials/components in our products', and 'firms in our business network know how our products are produced' respectively). These items indicate that SCN actors may be more transparent if they provide information about how their products are produced from the initial supplier to the end customers. SCN actors can share this information with other SCN actors in the SCN if they are asked. The SCN actors may use different information systems such as enterprise resource planning (ERP), collaborative planning, forecasting and replenishment (CPFR), and advanced planning and scheduling (APS) to provide this information to other SCN actors (Wong, Lai & Bernroider 2015).

According to the fourth ranked item in the loading factors (0.711), the information can also concern the SCN actor's suppliers. This item ('firms in our business network can find information about our suppliers') indicates that learning information about the SCN actor's suppliers can also represent transparency in the business network, which is examined in other research (Awaysheh & Klassen 2010). The fifth and sixth ranked items in the loading factors (0.589 and 0.572 respectively) are related to the 'legitimacy of the SCN actor' in the eyes of other SCN actors ('firms in our business

network comply with our requests, even if there is no contract between us' and 'we expect firms in our business network to accommodate our request, even if there is no contract between us' respectively). These items underline the importance of being legitimate and how it can affect the SCN actors' transparency within the SCN (Mueller, Dos Santos & Seuring 2009; Egels-Zandén & Hansson 2016). This legitimacy can be enhanced when, for example, sustainability standards such SA8000 are implemented by SCN actors, leading to greater transparency in the SCN (Awaysheh & Klassen 2010). Thus, the legitimacy of the SCN actors can be considered as a way to increase transparency.

5.5.4.3 Distance

All five items related to this factor are extracted from question 13 (questions for Coles) and question 22 (questions for Woolworths) of the web-based questionnaire. These items examine the extent of a SCN actor's relationship with both focal firms. The first and third ranked item in the loading factors (0.827 and 0.770) are related to 'physical distance' between SCN actors and their focal firms ('it takes too much time to schedule a face-to-face meeting with Coles/Woolworths' and 'we find it very costly to hold a face-to-face meeting with Coles/Woolworths' respectively). This type of distance can be a challenging issue especially in terms of transportation of products between SCN actors and focal firms (Draganić et al. 2017). These items indicate the difficulties in creating face-to-face communication in terms of the time and cost required by both parties. As the physical distance can impact the way that two firms interact (Cummings & Teng 2003; Steven & Britto 2016), it is vital that focal firms consider these items in analysing their SCN structure.

The second and fourth ranked item in the loading factors (0.782 and 0.663 respectively) are associated with the 'organisational distance' between focal firms and their SCN actors ('exchanging information about our products with Coles/Woolworths is difficult' and 'we do not exchange critical information about our products with Coles/Woolworths'). These items concentrate on the difficulties to coordinate transaction and exchange information between both parties. The organisational distance can have impacts on the relationships between two parties (Leszczyńska &

Pruchnicki 2015; Parjanen, Harmaakorpi & Frantsi 2010; Ralyté et al. 2008). These items indicate that focal firms need to investigate how the information exchange process operates with their SCN actors to facilitate their analysing the SCN structure. The fifth ranked item in the loading factors (0.606) is associated with the 'cultural distance' between focal firms and their SCN actors ('the communication tools we use are different to Coles/Woolworths'). This item indicates the differences in communication tools (such as infrastructure and software applications) between focal firms and their SCN actors. Focal firms view the cultural distance as a critical issue in establishing an appropriate type of relationship (Grewal et al. 2018). This item can also be highlighted in the case of working with foreign SCN actors, as the possibilities of having the cultural distance will be increased (Hendriks, Slangen & Heugens 2018; Parmigiani, Klassen and Russo 2011).

5.5.4.4 Buyer dependency

All three items in this factor are from question 11 (questions for Coles) and question 20 (questions for Woolworths) of the web-based questionnaire (see Appendix A). In contrast to the supplier dependency, buyer dependency measures the extent that focal firms are dependent on their SCN actors. The first ranked item in the loading factors (0.844) relates to the focal firms' situation in 'having alternatives' to the products provided by SCN actors ('Coles/Woolworths do not have alternatives to our products'). This item concentrates on the extent that focal firms are dependent on the products of their SCN actors. To analyse the SCN structure, the focal firms need to consider this item as it can impact the way focal firms and their SCN structure are positioned (Kim & Wemmerlöv 2015; Tanskanen 2015).

The second ranked item in the loading factors is related to 'the difficulties stemming from ending the relationship with SCN actors' (it would be difficult for Coles/Woolworths to stop working with us). Focal firms may face problems when they decide to stop working with their SCN actors. For example, in the case of private label products, the focal firm may make a contract with their SCN actors stipulating the provision of a certain product. In this regard, it would be difficult for focal firms to terminate the relationship with their SCN actors.

The third ranked item in the loading factors (0.803) is related to the 'difficulties in substituting the SCN actors' products' (if we do not sell our products to Coles/Woolworths, they find it difficult to substitute our products). This item suggests that focal firms need to analyse their ability to find replacements for the products provided by their SCN actors. Furthermore, consistent with past research (Touboulic, Chicksand & Walker 2014; José Sanzo et al. 2007), this item suggests that focal firms can measure this item to investigate the extent of their dependency on their SCN actors. Similar to the previous item, focal firms can use the opportunity of not being dependent on their SCN actors to increase their negotiating power.

5.5.4.5 RE power

As mentioned in section 5.5.2, RE power is named for its association with reference and expert power. The items related to the RE power (already outlined in Table 5-13) are extracted from question 7 of the web-based questionnaire. Based on the information presented in Table 3-5 (Chapter Three), the reference power relates to the extent that a SCN actor is valued by other SCN actors (Zhao et al. 2008). Two items have been selected to reflect the reference power. The first item related to the reference power (which has the second rank in the loading factors (0.798) in items related to RE power) is 'firms in our business network are proud to be closely associated with us'. This item indicates the extent that SCN actors feel proud and satisfaction as a result of having a relationship with other SCN actors. This satisfaction may increase an SCN actor's power in the business network as other SCN actors may find them valuable and have a tendency to create a relationship with them.

The second item related to the reference power (which has the first rank in the loading factors (0.856) in items related to RE power) is 'firms in our business network admire us as an attractive reputational resource'. This item identifies the extent that other SCN actors view one SCN actor as an attractive target with which to communicate and build a relationship. For example, by maintaining a relationship with NGOs working specifically on sustainability (such as Greenpeace), SCN actors can advance their reputation and strengthen their brand in sustainability (Alvarez, Pilbeam & Wilding

2010). Hence, the SCN actors view their reputation as an influential factor over other SCN actors.

The expert power, which has the third rank in the loading factors (0.790), is concerned with the extent that a SCN actor has access to the product knowledge required by other SCN actors. Namely, 'firms in our business network find the knowledge of our experts about their products/services valuable' relates to expert power. This item indicates that having access to the skills and techniques related to the products can play a significant role in influencing other SCN actors in the SCN. For example, retailers can use their knowledge of consumers' demands in the design of the product to influence their suppliers in their SCN (MacCarthy & Jayarathne 2012).

5.5.4.6 RC power

As mentioned in section 5.5.2, RC power is the label for the sixth factor extracted from the EFA for the SCN structure (Table 5-13) as it pertains to reward and coercive power. The reward power relates to the ability of the SCN actor to mediate rewards to other SCN actors (Zhao et al. 2008). According to Schleper, Blome and Wuttke (2017), this can happen through providing incentives (such as placing a large order volume) to the SCN actors; for example, if they make good progress in following codes of conduct. The first and second items related to the reward power (which has the third and first rank in the loading factors (0.662 and 0.859 respectively)) are 'we can offer incentives to firms in our business network so they comply with our requests' and 'firms in our business network cooperate in implementing a new practice if we provide incentives' respectively. These items indicate the power of providing incentives to other SCN actors who can use this power to encourage their other SCN actors to follow their requests.

In contrast to the reward power, the coercive power relates to the ability of the SCN actor to mediate punishment to other SCN actors (Zhao et al. 2008). The item related to the coercive power, which has the second rank in the loading factors (0.745) is 'we are not treating firms in our business network very well if they do not accept our requests'. This item indicates that SCN actors can use the ability to punish other SCN

actors to influence them to follow their request. For example, customers can use the threat of terminating the relationships with their suppliers if they do not comply with the sustainability standard (Lee & Rammohan 2016).

5.6 Summary

This chapter presented the data analysis from the web-based survey and discussed the results. The objective of this chapter was to address the first and second subsidiary research questions stated in Chapter One. The first question was intended to explore various factors determining the structure of SCN, while the second question was aimed at identifying the various types of relationships that focal firms apply to manage sustainability issue in their SCN.

This chapter begins with analysing the demographic information from the received questionnaire. From a total of 278 firms in the sample size selected for two focal firms' SCN, 133 questionnaires were received. However, 66 questionnaires were completed providing a 24% response rate. As explained in Chapter Four, each questionnaire has two parts in which respondents answered the questions related to one of the focal firms (Coles) in the first part and another focal firm (Woolworths) in the second part. After combining questionnaires for both focal firms and removing missing data, 67 usable questionnaires were identified.

Next, to answer the first and second subsidiary research questions, EFA was conducted to explore the validity of items related to identifying factors related to RMS and the SCN structure. Two separate EFA processes were performed. In the first process, items related to RMS were used as an input for the EFA to answer the first subsidiary research question. The results indicated that there are four RMS (non-compliance, transactional, dictatorial and collaborative) that focal firms apply to manage sustainability issues within their SCN. These RMS are prioritised based on their contribution to the overall solution. By categorising various sustainability practices into these RMS, focal firms manage sustainability issues within their SCN. Therefore, these four RMS can be considered as the types of relationships that exist

between the focal firm and SCN actors to incorporate the sustainability concept into a SCN, which the first subsidiary research question is seeking.

In the second EFA process, the collected data relating to the SCN structure was applied as an output for the EFA to explore the number of factors that conceptualise the SCN structure and to answer the second subsidiary research question. Six factors (transparency, RC power, RE power, distance, supplier dependency and buyer dependency) are identified which are prioritised based on their contribution to the overall solution. By analysing the SCN structure through these factors, focal firm can effectively analyse the interrelationships among numerous SCN actors within their SCN. Therefore, these six factors can be considered as instrumental in determining the structure of relationships between SCN actors within a SCN, which the second subsidiary research question is seeking.

By identifying the RMS and factors that determine the SCN structure in this chapter, the next chapter is best served to explore and analyse how the SCN structure can affect the RMS in detail, answering the third subsidiary research question.

CHAPTER 6 DATA ANALYSIS - IDENTIFYING THE RELATIONSHIPS

6.1 Introduction

After conducting the first part of the data analysis in Chapter Five, four RMS (non-compliance, transactional, dictatorial and collaborative) and six factors related to the SCN structure (transparency, RC power, RE power, distance, supplier dependency and buyer dependency) were identified and validated. Chapter Six presents the second part of the data analysis that concentrates on the relationships between the SCN structure and RMS by using multiple regression analysis. This chapter also investigates and addresses this research's third subsidiary question as stated in Chapter One:

- SRQ3: How do the relationships between SCN actors affect the focal firm's relationship management strategies to achieve a sustainable SCN?

The discussions in Chapters Three and Five suggest that focal firms' choices of RMS are highly dependent on the characteristics of its SCN structure. In deciding on an appropriate type of RMS, a focal firm should consider the factors affecting its SCN structure. Thus, four hypotheses (as presented in Chapter Three), are tested in this chapter based on the results from the empirical study as follows:

Hypothesis 1: Dependency, distance, power and transparency influence focal firms' choice of non-compliance RMS to manage sustainability in the SCN.

Hypothesis 2: Dependency, distance, power and transparency influence focal firms' choice of transactional RMS to manage sustainability in the SCN.

Hypothesis 3: Dependency, distance, power and transparency influence focal firms' choice of dictatorial RMS to manage sustainability in the SCN.

Hypothesis 4: Dependency, distance, power and transparency influence focal firms' choice of collaborative RMS to manage sustainability in the SCN.

This chapter begins by testing and validating the assumption of the multiple regression analysis. Next, the multiple regression model for each RMS will be conducted and finally, the results will be discussed.

6.2 Multiple regression analysis

To test the hypothesis, a multiple linear regression model is used to investigate the relationships among the different variables related to the SCN structure and RMS. As the sample size of this research is relatively small, applying the structural equation model (SEM) method is unlikely to provide useful proper results. Based on the various views in the literature, a minimum sample size of 100 or 200 is required to run SEM which was not possible in this study (Kock & Hadaya 2018; Wolf et al. 2013). However, the multiple linear regression analysis is considered an appropriate tool because the conceptual framework contains six independent variables (supplier dependency, buyer dependency, transparency, distance, 'RC' power, and 'RE' power) of which their relationships need to be examined in relation to the four dependent variables (collaborative RMS, dictatorial RMS, transactional RMS, and non-compliance RMS). In addition, being a multivariate statistical technique, a multiple linear regression analysis is a suitable tool to determine the impact of independent variables on the dependent variables (Nyaoga, Magutu & Aduba 2015). The relationship between the dependent variables (Y) and the independent variables (X_p) is based on the following equation:

$$E(Y|X) = \alpha + \beta_1 X_1 + \cdots + \beta_p X_p.$$

Where α is the intercept (constant) and the βp are coefficients, which indicate the individual contribution of each independent variable to the dependent variables. The value of the coefficient can be both negative and positive. The negative value represents the negative relationship between the independent variable and the dependent variable, while the positive value represents the positive relationship between these variables.

Before conducting multiple regression analysis, four conditions including 1) the assumptions of normality, 2) multicollinearity, 3) homoscedasticity for all variables,

and 4) the sample size are tested to verify the next steps (Hair et al. 2010). The normality test is deemed satisfactory by using skewness and kurtosis (as explained in Chapter Five). The other three conditions are discussed in the following sections.

6.2.1 Multicollinearity

The purpose of the regression analysis is to determine the degree of dependency of the dependent variables on the independent variables, rather than the interdependency. Multicollinearity becomes noticeable when two or more independent variables are highly correlated in the multiple linear regression model (Goodhue, Lewis & Thompson 2017). Multicollinearity measures the interdependency between independent variables and can be considered a serious threat to the accurate estimation of the relationships between independent and dependent variables in regression techniques (Kalnins 2018). To address the issue of multicollinearity, the procedure recommended by Wiengarten et al. (2011) and Gray and Kinnear (2012) is used. They suggest that the independent variables need to be centered and the variation inflation factor (VIF) should be checked. The centring process is used to identify possible threats stemming from the high correlation between independent variables (Gray & Kinnear 2012). Results in Table 6-1 indicate no issues of multicollinearity since all the values for VIF are less than the recommended threshold level of 10 as proposed by Mason and Perreault (1991) which has been used by numerous researchers (Mukatia, Githii & Ombati 2018). The Durbin-Watson test is also conducted, revealing that the output is free from the autocorrelation effect as the results for each RMS (Table 6-2) are within the acceptable range of between 0 and 4 (Mooi & Serstedt 2011). These results indicate that the multicollinearity is not significant. Thus, this assumption of the multiple linear regression model is not violated.

Table 6-1. Multicollinearity for independent variables

Independent variables	Collinearity Statistics	
	Tolerance	VIF
Transparency	0.786	1.273
‘RE’ power	0.833	1.200
‘RC’ power	0.856	1.169
Supplier dependency	0.816	1.226
Buyer dependency	0.768	1.302
Distance	0.873	1.145

Table 6-2. Durbin-Watson test for independent variables in each RMS

Dependent	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
Non-compliance	0.544	0.295	0.225	1.307	2.089
Transactional	0.616	0.380	0.318	1.067	1.842
Dictatorial	0.437	0.191	0.110	1.461	2.460
Collaborative	0.543	0.295	0.225	1.282	1.995

6.2.2 Homoscedasticity

The purpose of homoscedasticity testing is to check the consistency in the disturbance variance at each observation point and the zero value for the disturbance covariance at all pairs of observation points (Shukur 2002). If this test is not satisfactory (indicating the presence of heteroscedasticity), there will be invalid inferences while using the traditional formula for the ordinary least squares (OLS) variance (Shukur 2002). For this purpose, this research uses two tests to check the homoscedasticity of the data. Firstly, a general test referred to as the Breusch±Pagan (BP) test (Breusch & Pagan 1979) and then the Koenker test, which is more suitable for a small sample size (Lie 2015), is used as it covers numerous homoscedastic situations. The results in Table 6-3 indicate that there is no sign of heteroscedasticity in the data, as the *p-value* for each test in each regression model is more than the significant level of 0.05.

Table 6-3. Homoscedasticity test for independent variables in each RMS

Dependent variables	Test	LM	Sig
Non-compliance	BP	6.576	0.362
	Koenker	6.725	0.347
Transactional	BP	3.259	0.776
	Koenker	4.121	0.66
Dictatorial	BP	2.484	0.87
	Koenker	3.655	0.723
Collaborative	BP	3.305	0.77
	Koenker	5.516	0.48

6.2.3 Sample size

Although it is confirmed that the larger sample size can positively impact the statistical power of the regression models, there is no agreement among researchers of the appropriate sample size in regression analyses (Slade et al. 2015). For example, Hair, et al. (2010) propose that at least 15-20 observations are needed for each independent

variable while Tabachnick and Fidell (2007) argue that the required sample size can be calculated by 50 + 8K (where K is the number of independent variables). Other researchers also suggest a 10:1 observations to independent variables ratio (Kapoor, Dwivedi & Williams 2015). The sample size in this research follows the general rule suggested by Cohen (1988) that has been applied to numerous studies (Jabbour 2015; Stefanelli et al. 2014). Cohen (1988) argues that the minimum sample size can be determined by the power analysis. The reason for choosing this rule is that Cohen's model not only covers the magnitude of statistical test results by calculating the ρ value, but it also considers additional parameters like the statistical power and population effect size. This characteristic provides a situation to release more meaningful results (Chuan & Penyelidikan 2006). Using G*Power 3 software (Faul et al. 2007) with six independent variables, under the general assumption of 0.05 significant level, a desired power of 0.80, and a medium effect size (f2=0.25), the minimum number is 64 which is smaller than the sample sizes used in this research (67). Since there is no sign of violation, multiple regression analysis is conducted to analyse the impact of the SCN structure on RMS to manage the sustainability issues of the SCN.

6.3 Data analysis

After analysing and assessing the normality, multicollinearity, homoscedasticity, and sample size, the regression analysis is conducted to investigate the significance of relationships between independent and dependent variables. In addition, suppliers in the SCN can be divided into different sizes (small, medium, and large) and years of operation. They may also have different durations of relationships with their focal firms. To assess the type of RMS that focal firms adopt to manage sustainability issues in their suppliers, this research uses the following four control variables:

1. Suppliers' number of employees (as a sign of size)
2. Suppliers' financial turnover (as a sign of size)
3. Suppliers' age (how many years they have been operating)
4. Length of relationship with focal firms

In relation to the first and second variable, which indicate suppliers' size, prior studies have indicated that firm size can affect the adoption of sustainability practices (Bourlakis et al. 2014; Darnall, Henriques & Sadorsky 2010). For example, smaller firms are more likely to respond proactively to the stakeholder pressures to create a good reputation and attract more clients, which is central for smaller firms' success (Panwar et al. 2016). In contrast, because of their greater resources, larger firms can resist stakeholder pressure as they have more organisational power (Lewis, Walls & Dowell 2014). Regarding the third factor, the suppliers' age, firms' performances may differ between young and mature firms due to the "liabilities associated with newness" (Lai et al. 2013, p. 3044). The age difference can have both a negative impact and a positive impact on the adoption of sustainability practices (Hoogendoorn, Guerra & van der Zwan 2015). Length of relationship is the fourth factor, which can affect the type of collaboration and cooperation that focal firms apply to new suppliers and old suppliers (Chu & Wang 2012). Since trust develops over time, the length of relationship can be considered a sign of trust among focal firms and their suppliers (Audrey Korsgaard et al. 2018), which can have a significant impact on the types of governance mechanisms that focal firms apply to their suppliers (Alvarez, Pilbeam & Wilding 2010). Considering the importance of these four control variables on the types of the RMS, this research also analyses their effects on the RMS. The following sub-sections discuss the results for each of the RMS.

6.3.1 The impact of structure on non-compliance RMS

To investigate the relationship between the independent variables (predictors) and non-compliance RMS, the regression equation can be written in the following form:

$$\textit{Non-compliance RMS} = \alpha + \beta_1(\textit{transparency})_1 + \beta_2(\text{`RE' power})_2 + \beta_3(\text{`RC' power})_3 + \beta_4(\textit{distance})_4 + \beta_5(\textit{supplier dependency})_5 + \beta_6(\textit{buyer dependency})_6.$$

The multiple regression analysis is conducted to identify the independent variables that would significantly affect the dependent variable. As indicated in Table 6-4, the adjusted R square is 0.225 which means 23% of the variance in the non-compliance RMS is explained by the six independent variables. In other words, taken as a set, the

predictors (transparency, 'RE' power, 'RC' power, supplier dependency, buyer dependency and distance) account for 23% of the variance in non-compliance RMS. This is important as an adjusted R square does not measure how much a given individual predictor accounts for, but it accurately explains when all the predictor variables are considered as a group.

Table 6-4. Regression model summary for non-compliance RMS

Dependent variable	R	R square	Adjusted R square	Std. error of the estimate
Non-compliance RMS	0.544	0.295	0.225	1.30734

Table 6-5 provides information regarding the efficiency of the model in predicting the variances in the dependent variable. The information in this table is a result of the test of whether the adjusted R square is significantly greater than zero. The results indicate the significance value is less than 0.05, meaning that the predictors are able to account for a significant amount of the variance in the non-compliance RMS, and therefore, confirmed the reliability of the regression model. This indicated that the independent variables are a good predictor of the dependent variable, which means running the model provides valuable outcomes.

Table 6-5. Reliability of the regression model for non-compliance RMS

Dependent variable		Sum of squares	Degree of freedom	Mean square	F-test	Sig.
Non-compliance	Regression	42.998	6	7.166	4.193	0.001
	Residual	102.548	60	1.709	-	-
	Total	145.546	66	-	-	-

Table 6-6 indicates the data used to formulate the regression line. In contrast to the regression model summary and the regression reliability (Tables 6-4 and 6-5) which consider regression analysis overall or the predictors as a set, the coefficients presented in Table 6-6 each consider the individual predictors to measure whether a given predictor is significant in its own right. The B value for constant is 3.772 which is the value for α in the regression equation. For the independent variables, the value of unstandardised coefficients (β) is used to formulate the regression model. To select which of these six independent variables significantly impact the non-compliance RMS, the *p-value* (sig) for each test is checked. Based on the 95% level of confidence,

if the *p-value* is less than 0.05, the related independent variable is considered as being significantly important in the prediction of the dependent variable. However, based on the *p-value* in the last column (sig) in Table 6-6, only one independent variable (distance) has a significant impact (β=0.553, t-value = 3.857, *p-value* = 0.000) on the non-compliance RMS. As indicated in Table 6-6, the other independent variables (transparency, RE power, RC power, supplier dependency and buyer dependency) are not significant predictors of the non-compliance RMS as they have *p-value*s of 0.298, 0.181, 0.964, 0.461, and 0.222, respectively, which all are more than 0.05. The same analysis is conducted for the constant, revealing a *p-value* of less than 0.05, which is significantly important in the regression model. Thus, based on these statistics results, the regression equation for non-compliance RMS is:

*Non-compliance RMS= 3.772+ 0.553*distance.*

This means that for every one unit of change in the value of distance, the value of the non-compliance RMS is increased by a 0.553 unit of change. Analysing from a standard deviation perspective, Table 6-6 indicates the values of beta for standardised coefficients in each individual independent variable. These values mean for every standard deviation of movement in independent variables, exactly how much the standard deviation for the dependent variable is changed. Considering the same rule of the *p-value* less than 0.05, for one unit of the change in the standard deviation for distance, the unit value of the standard deviation for non-compliance RMS will be increased by 0.447.

Table 6-6. Coefficients of independent variables for non-compliance RMS

Dependent variable	**Independent variables**	**Unstandardised coefficients**		**Standardised coefficients**	**T-test**	**Sig.**
		B	Std. Error	Beta		
Non-compliance RMS	(Constant)	3.772	1.641	-	2.298	0.025
	Transparency	-0.177	0.169	-0.128	-1.050	0.298
	‘RE’ power	-0.288	0.212	-0.161	-1.355	0.181
	‘RC’ power	-0.007	0.152	-0.005	-0.045	0.964
	Supplier dependency	-0.095	0.127	-0.089	-0.743	0.461
	Buyer dependency	0.146	0.118	0.153	1.234	0.222
	Distance	0.553	0.143	0.447	3.857	0.000

The unstandardised coefficients for control variables are also reported in models 1-5 in Table 6-7 (more information regarding the independent variables such as T-test and *p-value*s are demonstrated in Appendix G). Model 1 includes all independent variables, while to develop models 2-5, the control variables are added in sequence. Model 2 includes the length of relationship (years), model 3 includes the length of relationship and the number of employees, model 4 includes the length of relationship, the number of employees, and suppliers' age, and model 5 includes the length of relationship, the number of employees, suppliers' age, and financial turnover. To provide more information regarding the reliability of the model and significance of variables, this research uses four levels of confidence, including 90%, 95%, 99%, and 99.9%.

Table 6-7. Results of regression analysis for non-compliance RMS

Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Transparency	-0.177	-0.157	-0.153	-0.165	-0.076
RE power	-0.288	-0.322	-0.329	-0.329	-0.340
RC power	-0.007	-0.001	-0.010	-0.003	-0.025
Supplier dependency	-0.095	-0.116	-0.118	-0.113	-0.157
Buyer dependency	0.146	0.147	0.153	0.150	0.104
Distance	**0.553**** **(0.000[+])**	**0.550**** **(0.000)**	**0.556**** **(0.000)**	**0.569**** **(0.000)**	**0.471***** **(0.004)**
Control variables					
Length of relationship (years)	-	0.069[++]	0.075	0.094	-0.026
Number of employees	-	-	-0.057	-0.051	-0.122
Firm's age	-	-	-	-0.051	-0.075
Financial turnover	-	-	-	-	**0.543**** **(0.037)**
Regression results					
F	**4.193***** **(0.001)**	**3.590***** **(0.003)**	**3.136***** **(0.005)**	**2.752**** **(0.010)**	**3.087***** **(0.003)**
R Square	0.295	0.299	0.302	0.303	0.355
Adjusted R Square	0.225	0.216	0.206	0.193	0.240

*Sig<0.1; **Sig<0.05; ***Sig<0.01; ****Sig<0.001

+ The values in the bracket are the *p-value*s

++ These values are unstandardised coefficients

The main results are highlighted as follows:

- All models are reliable:
    - *P-value*= 0.001<0.01 and adjusted R square=0.225 in model 1

- *P-value*= 0.003<0.01 and adjusted R square=0.216 in model 2
- *P-value*= 0.005<0.01 and adjusted R square=0.206 in model 3
- *P-value*= 0.010<0.05 and adjusted R square=0.193 in model 4
- *P-value*= 0.003<0.01 and adjusted R square=0.240 in model 5
- For example, in model 5, 24% of the variance in the dependent variable, non-compliance RMS, can be explained by the six independent variables.

- The results in all five models indicated that implementing the non-compliance RMS is affected only by distance, which means one out of six factors can affect the non-compliance RMS. Thus, the results slightly supported H1
  - β = 0.553, *p-value*= 0.000 <0.001 in model 1
  - β = 0.550, *p-value*= 0.000 <0.001 in model 2
  - β = 0.556, *p-value*= 0.000 <0.001 in model 3
  - β = 0.569, *p-value*= 0.000 <0.001 in model 4
  - β = 0.471, *p-value*= 0.004 <0.01 in model 5
  - For example, in model 5, which had the highest value of the adjusted R square (0.240), a one point increase in the value of distance (β = 0.471, *p-value*= 0.004 <0.01) can lead to a 0.471 point increase in the value of collaborative RMS.
- Regarding the control variables in all five models, financial turnover is the only independent variable which affected the non-compliance RMS (β = 0.543, *p-value*= 0.037 <0.05 in model 5).
- The same analytical process for other RMS are performed in the sections 6.3.2, 6.3.3, and 6.3.4.

6.3.2 The impact of structure on transactional RMS

The regression model for investigating the relationship between the independent variables and transactional RMS can be modelled as:

$$Transactional\ RMS = \alpha + \beta_1(transparency)_1 + \beta_2(\text{'RE' power})_2 + \beta_3(\text{'RC' power})_3 + \beta_4(distance)_4 + \beta_5(supplier\ dependency)_5 + \beta_6(buyer\ dependency)_6.$$

The same multiple regression analysis is conducted to identify which of the independent variables had a significant effect on the dependent variable. Table 6-8 provides general information about the regression model. As indicated, the value of 0.318 for adjusted R square indicated that around 32% of the total variability in the dependent variable, transactional RMS, can be explained by the six independent variables as a group.

Table 6-8. Regression model summary for transactional RMS

Dependent variable	R	R square	Adjusted R square	Std. error of the estimate
Transactional RMS	0.616	0.380	0.318	1.06657

To check the efficiency of the regression model in predicting the dependent variable by the independent variables, the F-test is conducted. The results in Table 6-9 show that the *p-value* (indicated in sig column) is less than 0.05 which is satisfactory and confirms that the regression model is reliable. Thus, running the regression model is worthy enough since the independent variables are considered good predictors of the transactional RMS.

Table 6-9. Reliability of the regression model for transactional RMS

Dependent variable		Sum of squares	Degree of freedom	Mean square	F-test	Sig.
Transactional RMS	Regression	41.829	6	6.972	6.129	0.000
	Residual	68.254	60	1.138	-	-
	Total	110.083	66	-	-	-

Based on the data in Table 6-10, the regression line can be formulated. As indicated, the *p-value* in the sig column for the three independent variables, supplier dependency, buyer dependency, and distance are 0.015, 0.018, and 0.000 which is less than 0.05. This indicated that these three independent variables are significant predictors of transactional RMS. However, the *p-value* for transparency is 0.054 which is close to 0.05; therefore, this research considered this independent variable as a significant predictor of transactional RMS as well. Considering the direct relationship, the values for unstandardised coefficients indicated that transparency and supplier dependency positively affected the transactional RMS; however, the buyer dependency had a

negative relationship with transactional RMS. The other independent variables are not considered significant as the *p-value*s are more than 0.05 (0.187 for 'RE' power and 0.620 for 'RC' power). In addition, the value for the constant is more than 0.05 which indicated that the constant is not significant in the regression model. Therefore, according to the information above, the regression equation for transactional RMS can be modelled as:

*Transactional RMS= 0.270*transparency+ 0.260*supplier dependency- 0.235*buyer dependency+ 0.497*distance.*

Table 6-10. Coefficients of independent variables for transactional RMS

Dependent variable	**Independent variables**	**Unstandardised coefficients**		**Standardised coefficients**	**T-test**	**Sig.**
		B	**Std. Error**	**beta**		
Transactional RMS	(Constant)	1.732	1.339	-	1.293	0.201
	Transparency	0.270	0.138	0.225	1.962	0.054
	'RE' power	-0.231	0.173	-0.149	-1.334	0.187
	'RC' power	0.062	0.124	0.055	0.499	0.620
	Supplier dependency	0.260	0.104	0.282	2.503	0.015
	Buyer dependency	-0.235	0.096	-0.283	-2.439	0.018
	Distance	0.497	0.117	0.462	4.250	0.000

The equation indicates that increasing one unit in the value of the independent variables transparency, supplier dependency, and distance can increase 0.270, 0.260, and 0.497 units respectively in the value of the dependent variable, transactional RMS. This is implied differently for buyer dependency which can decrease by a 0.235 unit in the value of transactional RMS when increasing one unit in the value of buyer dependency.

Regarding changes in the standard deviations, Table 6-10 presents the value for beta as standard coefficients for each individual independent variable. For those independent variables with a *p-value* of less than 0.05, data in Table 6-10 indicates that a one point increase in the standard deviations of transparency, supplier

dependency, and distance is associated with 0.270, 0.260, and 0.497 point increases respectively in the standard deviation of transactional RMS. However, a one point increase in the standard deviation of buyer dependency is associated with a 0.235 unit decrease in the standard deviation of transactional RMS.

Regarding the effect of control variables, Table 6-11 presents the results of regression analysis for transactional RMS (more information regarding the independent variables such as T-test and *p-value*s are demonstrated in Appendix H).

Table 6-11. Results of regression analysis for transactional RMS

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Transparency	**0.270* (0.054[+])**	**0.285* (0.050)**	**0.296** (0.039)**	**0.305** (0.040)**	**0.303* (0.048)**
RE power	-0.231[++]	-0.256	-0.276	-0.276	-0.276
RC power	0.062	0.065	0.043	0.038	0.038
Supplier dependency	**0.260** (0.015)**	**0.245** (0.029)**	**0.239** (0.030)**	**0.235** (0.036)**	**0.236** (0.039)**
Buyer dependency	**-0.235** (0.018)**	**-0.235** (0.019)**	**-0.218** (0.026)**	**-0.217** (0.029)**	**-0.215** (0.034)**
Distance	**0.497**** (0.000)**	**0.495**** (0.000)**	**0.513**** (0.000)**	**0.503**** (0.000)**	**0.506**** (0.000)**
Control variables					
Length of relationship (years)	-	0.05	0.066	0.051	0.054
Number of employees	-	-	**-0.156* (0.083)**	**-0.161* (0.082)**	-0.159
Firm's age	-	-	-	0.041	0.041
Financial turnover	-	-	-	-	-0.014
Regression results					
F	**6.129**** (0.000)**	**5.216**** (0.000)**	**5.116**** (0.000)**	**4.484**** (0.000)**	**3.966**** (0.000)**
R Square	0.380	0.382	0.414	0.415	0.415
Adjusted R Square	0.318	0.309	0.333	0.322	0.310

*Sig<0.1; **Sig<0.05; ***Sig<0.01; ****Sig<0.001
+ The values in the bracket are the *p-value*s
++ These values are unstandardised coefficients

The main results are highlighted as follows:

- The models are reliable having:
  - *P-value*= 0.000<0.001 and adjusted R square=0.318 in model 1

- *P-value*= 0.000<0.001 and adjusted R square=0.309 in model 2
- *P-value*= 0.000<0.001 and adjusted R square=0.333 in model 3
- *P-value*= 0.000<0.001 and adjusted R square=0.322 in model 4
- *P-value*= 0.000<0.001 and adjusted R square=0.310 in model 5

- In all five models, four independent variables including transparency, distance, supplier dependency, and buyer dependency had a significant effect on transactional RMS. For example, based on the results from model 3, which had the highest adjusted R square (which means 33.3% of the variance in transactional RMS can be explained by the six independent variables), it is evident that transactional RMS is affected by:
  - Transparency with $\beta = 0.296$ and *p-value*= 0.039<0.05;
  - Supplier dependency with $\beta = 0.239$ and *p-value*= 0.030<0.05;
  - Buyer dependency with $\beta = -0.218$ and *p-value*= 0.026<0.05; and
  - Distance with $\beta = 0.513$ and *p-value*= 0.000<0.001.
- Furthermore, the result indicated that there are significant positive relationships between transactional RMS with transparency, distance, and supplier dependency. For example, based on the statistic results in model 3 in Table 6-11, one point increases in the values of transparency, supplier dependency, and distance are associated with 0.296, 0.239, and 0.513 increases respectively in the value of transactional RMS.
- There is a significant negative relationship between buyer dependency and transactional RMS. For instance, according to the statistical results in model 3 in Table 6-11, increasing one point in the value of the buyer dependency can lead to decreasing 0.218 points in the value of the transactional RMS. Since four out of six factors can affect the transactional RMS, thus, the results mainly supported H2.
- Among the five models, in models 3 and 4, the number of employees is the only control variable that affected transactional RMS. The direction of the relationship is negative which indicated that as the value of the number of employees increased by one unit, the value of transactional RMS decreased by one unit. Although the *p-value*s of 0.083 in model 3 and 0.082 in model 4 are

more than 0.05 and is not meaningful at a 95% confidence level, their values indicated that this control variable (number of employees) can significantly affect the dependent variable, transactional RMS at a 90% confidence level.

6.3.3 The impact of structure on dictatorial RMS

Regarding the effect of independent variables on dictatorial RMS, the regression equation can be modelled as:

$$Dictatorial\ RMS = \alpha + \beta_1(transparency)_1 + \beta_2(\text{'RE' power})_2 + \beta_3(\text{'RC' power})_3 + \beta_4(distance)_4 + \beta_5(supplier\ dependency)_5 + \beta_6(buyer\ dependency)_6.$$

To identify which independent variables can affect the dependent variable, the multiple regression analysis is conducted. By considering the value of 11% for adjusted R square (Table 6-12), the model can explain that 11% of the variance in the dictatorial RMS can be predicted by the six independent variables (taken as a set).

Table 6-12. Regression model summary for dictatorial RMS

Dependent variable	R	R square	Adjusted R square	Std. error of the estimate
Dictatorial RMS	0.437	0.191	0.110	1.46107

Regarding the efficiency of the regression model, the results in Table 6-13 indicated that the *p-value* is 0.042 which is lower than 0.05. This value confirmed the reliability of the regression model and validated that the six independent variables are a good predictor of the dependent variable, dictatorial RMS.

Table 6-13. Reliability of the regression model for dictatorial RMS

Dependent variable		Sum of squares	Degree of freedom	Mean square	F-test	Sig.
Dictatorial RMS	Regression	30.152	6	5.025	2.354	0.042
	Residual	128.084	60	2.135	-	-
	Total	158.235	66	-	-	-

The information required to formulate the regression line for dictatorial RMS can be extracted from Table 6-14. Considering the *p-value* is less than 0.05, the results indicated that two independent variables, transparency and supplier dependency, had

a significant effect on the dependent variable, dictatorial RMS, by having *p-value*s of 0.006 and 0.039, respectively. The unstandardised coefficient for transparency and supplier dependency is 0.535 and 0.300, respectively. Regarding the value of the constant for the regression model, the results indicated that the *p-value* is 0.267 which is more than 0.05, meaning that the constant is not significant in predicting the dependent variable. Thus, using the unstandardised coefficient for independent variables which had a significant effect on the dependent variable, the regression equation can be formulated as:

*Dictatorial RMS= 0.535*transparency+ 0.300*supplier dependency.*

Table 6-14. Coefficients of independent variables for dictatorial RMS

Dependent variable	**Independent variables**	**Unstandardised coefficients**		**Standardised coefficients**	**T-test**	**Sig.**
		B	**Std. Error**	**beta**		
Dictatorial RMS	(Constant)	2.056	1.835	-	1.121	0.267
	Transparency	0.535	0.189	0.372	2.837	0.006
	'RE' power	-0.378	0.237	-0.203	-1.595	0.116
	'RC' power	-0.136	0.169	-0.101	-0.802	0.426
	Supplier dependency	0.300	0.142	0.272	2.111	0.039
	Buyer dependency	0.118	0.132	0.119	0.896	0.374
	Distance	0.001	0.160	0.000	0.003	0.997

The equation indicates that for every unit of increase in the value of the transparency and supplier dependency, the value of dictatorial RMS will be increased by 0.535 and 0.300 units, respectively.

Regarding the standardised coefficient, the results indicated the value of beta is 0.372 and 0.272 for transparency and supplier dependency, respectively. This indicated that a one point increase in the standard deviation of transparency and supplier dependency

will be reflected by 0.372 and 0.272 increases in the standard deviation of dictatorial RMS.

Regarding the effect of the control variables, Table 6-15 presents the regression results of the impact of the SCN structure on dictatorial RMS (more information regarding the independent variables such as T-test and *p-value*s are demonstrated in Appendix I).

Table 6-15. Results of regression analysis for dictatorial RMS

Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Transparency	**0.535*** (0.006[+])**	**0.522** (0.010)**	**0.535*** (0.009)**	**0.543** (0.010)**	**0.534** (0.014)**
RE power	-0.378[++]	-0.356	-0.372	-0.372	-0.371
RC power	-0.136	-0.139	-0.157	-0.164	-0.161
Supplier dependency	**0.300** (0.039)**	**0.314** (0.041)**	**0.310** (0.044)**	**0.305* (0.051)**	**0.309* (0.052)**
Buyer dependency	0.118	0.118	0.131	0.133	0.137
Distance	0.001	0.002	0.016	0.004	0.014
Control variables					
Length of relationship (years)	-	-0.045	-0.032	-0.052	-0.040
Number of employees	-	-	-0.121	-0.127	-0.120
Firm's age	-	-	-	0.052	0.054
Financial turnover	-	-	-	-	-0.054
Regression results					
F	**2.354** (0.042)**	**2.001* (0.070)**	**1.870* (0.082)**	1.643	1.457
R Square	0.191	0.192	0.205	0.206	0.206
Adjusted R Square	0.110	0.096	0.095	0.081	0.065

*Sig<0.1; **Sig<0.05; ***Sig<0.01; ****Sig<0.001
+ The values in the bracket are the *p-value*s
++ These values are unstandardised coefficients

The main results are highlighted as follows:

- Among the five models, model 1, 2, and 3 are reliable as these models present *p-value*s (0.042 in model 1, 0.070 in model 2, and 0.082 in model 3) less than 0.05, 0.1, and 0.1 for the F-test, respectively. This meant that only model 1 is acceptable at the confidence level of 95% and the other two models are acceptable at the confidence level of 90%.
- The adjusted R square values indicated that the models can explain 10% of the variation in the dependent variable (dictatorial RMS).
- In all three models in Table 6-15, the *p-value* for supplier dependency is less than 0.05, indicating its significant effect on the dictatorial RMS:
    - $\beta = 0.535$, *p-value*$=0.006<0.01$ in model 1
    - $\beta = 0.522$, *p-value*$=0.010<0.01$ in model 2
    - $\beta = 0.535$, *p-value*$=0.009<0.01$ in model 3
- In all three models in Table 6-15, the *p-value* for transparency is less than 0.05 indicating its significant effect on the dictatorial RMS:
    - $\beta = 0.300$, *p-value*$= 0.039<0.05$ in model 1
    - $\beta = 0.314$, *p-value*$= 0.041<0.05$ in model 2
    - $\beta = 0.310$, *p-value*$= 0.044<0.05$ in model 3
- Supplier dependency and transparency are statistically significant in explaining variation in dictatorial RMS. Since two out of six factors can affect the dictatorial RMS, therefore, H3 is partially supported.
- The results for all five models also indicated that the control variables had no significant impact on dictatorial RMS since all *p-value*s are more than 0.05.

6.3.4 The impact of structure on collaborative RMS

To investigate the relationship between the six independent variables and the dependent variable, collaborative RMS, the regression equation can be modelled as:

$$\textit{Collaborative RMS} = \alpha + \beta_1(\textit{transparency})_1 + \beta_2(\text{`RE' power})_2 + \beta_3(\text{`RC' power})_3 + \beta_4(\textit{distance})_4 + \beta_5(\textit{supplier dependency})_5 + \beta_6(\textit{buyer dependency})_6.$$

Similar to the previous regression model, the multiple regression analysis is conducted to identify the variables that would significantly affect the dependent variables. The adjusted R square for the regression model is 0.225 (Table 6-16). This value indicated that around 23% of the total variability in the dependent variable, collaborative RMS, can be predicted by the six independent variables when they are taken as a group.

Table 6-16. Regression model summary for collaborative RMS

Dependent variable	R	R square	Adjusted R square	Std. error of the estimate
Collaborative RMS	0.543	0.295	0.225	1.28235

Regarding the efficiency of the regression model and investigating whether this model is effective to be run, the results (Table 6-17) indicated that the *p-value* for the F-test is 0.001 which is less than 0.05. This indicated that the regression model is reliable and can predict the value of collaborative RMS with the six independent variables.

Table 6-17. Reliability of the regression model for collaborative RMS

Dependent variable		Sum of squares	Degree of freedom	Mean square	F-test	Sig.
Collaborative RMS	Regression	41.297	6	6.883	4.186	0.001
	Residual	98.665	60	1.644	-	-
	Total	139.963	66	-	-	-

Table 6-18 provides the data required to formulate the regression equation for collaborative RMS. The results indicated that the *p-value* for two independent variables, transparency and distance are 0.001 and 0.028 respectively, which are less than 0.5. This indicated that among the six independent variables (transparency, 'RE' power, 'RC' power, supplier dependency, buyer dependency and distance) only transparency and distance can significantly affect the dependent variable, collaborative RMS. The value for the unstandardised coefficient for transparency and distance are 0.589 and -0.316, respectively. Regarding the direction of the

relationship, the result in Table 6-18 indicated that transparency is positively related to collaborative RMS; however, distance is negatively related to collaborative RMS. Thus, based on these results, the regression equation can be formulated as:

*Collaborative RMS= 0.589*transparency - 0.316*distance.*

The equation indicated that if transparency increases by one unit of value, the collaborative RMS value will be increased by 0.589. In contrast, if the distance value increases by one unit of value, the value of collaborative RMS will be decreased by 0.316.

Regarding the value for the standardised coefficient, the results (Table 6-18) indicated that for a one point increase in the standard deviation of transparency, the value of collaborative RMS will be increased by 0.435. However, this relation is reversed for the independent variables of distance. The results indicated that if distance increases by one unit of value, the value of collaborative RMS will be decreased by 0.261.

Table 6-18. Coefficients of independent variables for collaborative RMS

Dependent variable	Independent variables	Unstandardised coefficients		Standardised coefficients	T-test	Sig.
		B	Std. Error	beta		
Collaborative RMS	(Constant)	-0.319	1.610	-	-0.198	0.844
	Transparency	0.589	0.166	0.435	3.557	0.001
	'RE' power	0.187	0.208	0.107	0.900	0.372
	'RC' power	-0.071	0.149	-0.056	-0.478	0.634
	Supplier dependency	0.022	0.125	0.022	0.180	0.858
	Buyer dependency	0.189	0.116	0.201	1.629	0.109
	Distance	-0.316	0.141	-0.261	-2.251	0.028

According to Table 6-19, all models are reliable as the *p-value*s of 0.001 in model 1, 0.001 in model 2, and 0.000 for model 3, 4, and 5 are less than 0.05 (more information regarding the independent variables such as T-test and *p-value*s are demonstrated in Appendix J).

Table 6-19. Results of regression analysis for collaborative RMS

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Transparency	**0.589*** (0.001[+])**	**0.518*** (0.003)**	**0.497*** (0.002)**	**0.464*** (0.005)**	**0.507*** (0.003)**
RE power	0.187[++]	0.307	0.346	0.346	0.341
RC power	-0.071	-0.090	-0.046	-0.027	-0.038
Supplier dependency	0.022	0.096	0.107	0.121	0.099
Buyer dependency	0.189	0.186	0.155	0.149	0.126
Distance	**-0.316** (0.028)**	**-0.306** (0.030)**	**-0.341** (0.011)**	**-0.307** (0.027)**	**-0.355** (0.015)**
Control variables					
Length of relationship (years)	-	**-0.239* (0.060)**	**-0.270** (0.024)**	-0.217 (0.102)	**-0.276* (0.054)**
Number of employees	-	-	**0.302*** (0.003)**	**0.319*** (0.002)**	**0.284*** (0.009)**
Firm's age	-	-	-	-0.141	-0.152
Financial turnover	-	-	-	-	0.265
Regression results					
F	**4.186*** (0.001)**	**4.275*** (0.001)**	**5.456**** (0.000)**	**4.921**** (0.000)**	**4.585**** (0.000)**
R Square	0.295	0.337	0.429	0.437	0.450
Adjusted R Square	0.225	0.258	0.351	0.348	0.352

*Sig<0.1; **Sig<0.05; ***Sig<0.01; ****Sig<0.001
+ The values in the bracket are the *p-value*s
++ These values are unstandardised coefficients

The main results are highlighted as follows:

- Since adjusted R square for model 5 (0.352) is higher than other models (0.351 in model 3, 0.348 in model 4, 0.258 in model 2, and 0.225 in model 1), it can be considered as the best fit for the sample data.
- In model 5, transparency ($\beta = 0.507$, *p-value*$= 0.003 < 0.01$) had a significant positive impact and distance ($\beta = -0.355$, *p-value*$= 0.015 < 0.05$) had a

significant negative impact on collaborative RMS. Since two out of six factors can affect the collaborative RMS, therefore, H4 is partially supported.

- Similarly, these two independent variables (transparency and distance) demonstrated their significant effect in the other four models:
    - Transparency:
        - $\beta = 0.589$, *p-value*= 0.001 <0.01 in model 1
        - $\beta = 0.518$, *p-value*= 0.003 <0.01 in model 2
        - $\beta = 0.497$, *p-value*= 0.002 <0.01 in model 3
        - $\beta = 0.464$, *p-value*= 0.005 <0.01 in model 4
    - Distance:
        - $\beta = -0.316$, *p-value*= 0.028 <0.05 in model 1
        - $\beta = -0.306$, *p-value*= 0.030 <0.05 in model 2
        - $\beta = -0.341$, *p-value*= 0.011 <0.05 in model 3
        - $\beta = -0.307$, *p-value*= 0.027 <0.05 in model 4
- In addition, regarding the control variables:
    - The length of the relationship with focal firms had significant negative effects of:
        - $\beta = -0.239$, *p-value*= 0.060 <0.1 in model 2
        - $\beta = -0.270$, *p-value*= 0.024 <0.05 in model 3
        - $\beta = -0.276$, *p-value*= 0.054 <0.1 in model 5
    - The number of employees had significant positive effects of:
        - $\beta = 0.302$, *p-value*= 0.003 <0.01 in model 3
        - $\beta = 0.319$, *p-value*= 0.002 <0.01 in model 4
        - $\beta = 0.284$, *p-value*= 0.009 <0.01 in model 5

6.4 Discussion

After performing multiple regression analysis and presenting the statistical results both for the SCN structure, in the form of six independent variables, and the RMS, in the form of four dependent variables, the following section discusses the individual results for each RMS.

6.4.1 Hypothesis one - the impact of the SCN structure on non-compliance RMS

In terms of non-compliance RMS, the results indicate that the distance from the suppliers is the only factor the focal firms consider in this strategy. The greater the distance from the suppliers, the less likely are the focal firms to address sustainability issues within the suppliers. The reason may be attributed to the difficulties in exchanging information, stemming from the greater distance between focal firms and suppliers, which can be a barrier to monitor suppliers' commitment to the sustainability standards. For example, differences in communication tools (organisational distance), organisational cultures (cultural distance), and making laborious efforts to hold a face-to-face meeting (physical distance) can diminish the focal firm's propensity to engage directly in the suppliers' sustainability practices. As sourcing from overseas has increased, the length of the supply chain by geographic distance, for example, will be increased which can create difficulties in implementing sustainability practices. As found in previous research (Delmas & Montiel 2009; Gooris & Peeters 2014), the increase in the physical and cultural distance can increase the asymmetries of information, which can impact focal firms' accessibility to the required information in suppliers. The length of the supply chain can also cause a distance from suppliers. For instance, it can become difficult for focal firms to track sustainability issues, such as working conditions, in suppliers who are positioned further upstream. This situation can encourage focal firms to apply hands-off approaches to their SCN.

The reluctance of the focal firms to manage sustainability issues with suppliers also implies that the suppliers may have no effect on the focal firms' performances. Thus, their sustainability practices are not valuable to the focal firms. Focal firms that have many suppliers, render greater costs associated with managing sustainability issues (Rauer and Kaufmann 2015). In this regard, the focal firms may choose suppliers with smaller distances from them, allowing a more optimal exchange of information. This result is partially consistent with previous studies relating to the impact of distance on the implementation of sustainability practices (such as Awaysheh & Klassen 2010;

Hoejmose, Grosvold & Millington 2013). Considering the impact of the control variables, the results indicate that the greater the financial turnover of suppliers, as an indicator of a firm's size (Nath & Ramanathan 2016), the greater the use of non-compliance RMS. This may be because large firms face more sustainability issues, for example, by generating more waste and emissions. Therefore, they use more sustainability practices. Consequently, focal firms can ensure they address sustainability issues by themselves.

6.4.2 Hypothesis two- the impact of the SCN structure on transactional RMS

Regarding the transactional RMS, the results indicate that when transparency, distance and supplier dependency increase, the focal firms' use of transactional RMS increases. In contrast, when buyers' dependency increases, the focal firms have higher reluctance to use this RMS. This means that when distance with the suppliers increases, the focal firms tend to devote less effort to addressing sustainability issues within the suppliers (similar to non-compliance RMS). Focal firms control the minimum requirements for sustainability standards and in some cases, the focal firm may use a third party to audit the sustainability commitments within the suppliers. This partially supports the findings from the in-depth case study research by Wilhelm et al. (2016). The case study suggests that focal firms may collaborate with prominent certification third parties such as Rainforest Alliances, Fairtrade, or UTZ to manage sustainability issues in the extremely fragmented supply chain where suppliers are at a great distance from the focal firms (Wilhelm et al. 2016). However, when the suppliers' transparency increases at the same time, the focal firms try to increase their participation in managing sustainability issues within the suppliers. This may reduce or mitigate the potential risk of endangering their brand stemming from the suppliers' non-compliance related to the sustainability issues. According to Meinlschmidt, Schleper and Foerstl (2018), when distance increases between the focal firms and their suppliers, the potential for perceived sustainability risk increases. Since advancement in technologies and media has enhanced the ability of firms to capture information from suppliers, it is more likely that sustainability violations by suppliers become more visible. Consequently, various stakeholders (such as NGOs, government

agencies, and end-consumers) hold focal firms accountable for the sustainability commitments in the entire supply chain (Hartmann & Moeller 2014), which may encourage the focal firms to take a proactive approach to manage sustainability issues.

The tendency to use transactional RMS could be weakened as the buyer dependency increases, yet it could be strengthened when the supplier dependency increases. The reason is that the buyers' dependency increases the suppliers' importance to the focal firms' overall business. Therefore, the focal firms prefer to manage sustainability issues with the suppliers since these issues can affect focal firms' sustainability performance (Touboulic, Chicksand & Walker 2014). This is supported by the literature which argues that as the focal firms' dependency on their suppliers increases, the potential for perceived sustainability risk would also increase (Meinlschmidt, Schleper & Foerstl 2018). Accordingly, instead of applying the hands-off approach, which transactional RMS provides, focal firms may apply proactive approaches such as working on team building and joint activities to manage the relationship. Thus, cooperative norms between focal firms and dependent suppliers may be favourable.

Interestingly, when supplier dependency increases, the focal firms believe they are important for the suppliers. As a result, the focal firms make little effort to manage sustainability issues with the suppliers since the suppliers have a strong motivation to be proactive in this area. Grimm, Hofstetter and Sarkis (2014) found that direct suppliers would more likely follow focal firms' requests if they are dependent on the focal firms' demand volume. Dependent suppliers may endanger their continuous co-operation with focal firms if they do not meet the requirements of sustainability issues. Thus, they make efforts to keep their business relationship with their focal firms alive. In contrast, as found in previous studies (Grimm, Hofstetter & Sarkis 2016), suppliers with less dependency on their focal firms may switch to customers who do not request compliance with sustainability standards. Focal firms may leave the responsibility of managing sustainability issues to outsiders (such as its major suppliers, NGOs, external service providers or other third parties) to evaluate suppliers' sustainability practices. Considering the effect of the control variables, the results indicate that there is a negative relationship between the number of employees, as an indicator of firms'

size (Mueller, Ouimet & Simintzi 2017), and the use of transactional RMS. This can also be justified by the reason that larger suppliers may not need to be monitored and controlled by focal firms as they usually perform sustainability practices.

6.4.3 Hypothesis three - the impact of the SCN structure on dictatorial RMS

The results indicate that the tendency towards using a dictatorial RMS by the focal firms increases when the supplier dependency increases. This means that the more important the focal firms' role in their suppliers' businesses, the greater the opportunity for focal firms to impose sustainability standards on the suppliers and urge them to commit to the standards. Due to the perceived dependence on their focal firms, suppliers may face a certain pressure to participate in sustainability initiatives (Grimm, Hofstetter & Sarkis 2016). As a result, suppliers may follow such standards if they want to continue their relationship with focal firms, as focal firms may terminate the relationship with suppliers in the case of non-compliance with sustainability standards, such as codes of conduct. The fear of the relationship terminating is a strong incentive for the dependent suppliers to implement sustainability practices at their focal firms' request. This motivation can be beneficial as it has been indicated by other research (Luthra et al. 2018) that it can prevent the loss of sales volume and potential damage to public image. Similarly, New (2015) found that in grocery retailing in the UK, which is highly concentrated, suppliers have consistently reported their fear of contract termination with their focal firms in the case of non-compliance with sustainability standards. Focal firms' power over their suppliers can be measured by the suppliers' dependency on the focal firms' valuable resources. It would be difficult for focal firms to enforce their suppliers' compliance with the sustainability standards if they do not have enough power over their suppliers. Similar to other studies (Grimm, Hofstetter and Sarkis 2016), this research argues that focal firms can only obtain information regarding the lower tier suppliers if they have power over their direct suppliers. Thus, by implementing the sustainability practices, the suppliers do not have the fear of being ignored and bypassed, and consequently, can continue their business relationship with the focal firm.

In addition, the focal firms' interest in using dictatorial RMS, such as auditing sustainability practices in the suppliers, is intensified when the suppliers' transparency increases. In this case, as there is a high probability that the sustainability violation by the suppliers is subjected to public scrutiny which can lead to negative spill over effects to the focal firms' reputations, the focal firms tend to force the suppliers to initiate sustainability practices irrespective of their constraint to protect their brand and reputation. As a result, in line with previous studies (Grimm, Hofstetter & Sarkis 2016), the focal firms may ask their direct suppliers to use an approved 'lower tier supplier list' or directly source from high-risk lower tier suppliers.

6.4.4 Hypothesis four - the impact of the SCN structure on collaborative RMS

The results illustrate that the higher the suppliers' transparency, the greater use of a collaborative RMS by focal firms. As previously explained in the transactional and dictatorial RMS discussion, the focal firms' tendency to participate in activities to address sustainability issues within the suppliers increases when the suppliers bring more transparency to the public. For example, by ensuring suppliers' adherence to the sustainability commitments, focal firms can reduce the probability that suppliers misbehave in sustainability practices such as violating human rights, which could collectively damage the focal firms' reputations. Similarly, Meinlschmidt, Schleper and Foerstl (2018) identify stakeholder salience as a crucial factor and the stakeholders as powerful actors in the SCN which can demand focal firms to react to sustainability violations immediately, such as child labour, by applying direct development programs to their SCN. In this case, the focal firms may extend collaborations with their suppliers and train them to manage sustainability issues, for example, by auditing in their respective lower-tier suppliers. Hence, focal firms may take a proactive approach and attempt to source directly from their lower-tier suppliers in the case of higher transparency related to the origin of the product.

When distance decreases at the same time as transparency increases, the focal firms are interested in applying collaborative RMS. For instance, the focal firms may collaborate with the suppliers through engaging directly in various sustainability practices by providing assistance to their personnel and improving their knowledge

and skills in managing sustainability issues. The reason for this may be that having less distance from suppliers facilitates the information exchange between both sides, as having difficulties in exchanging information can be considered as the most common barrier to the collaborative approach. This is also supported with the results provided by an in-depth case study by Wilhelm et al. (2016), which argue that in a highly transparent environment when the distance decreases, there is a potential opportunity for focal firms to gain some valuable in-depth knowledge on sustainability through collaboration with their suppliers. Thus, focal firms may find it worthwhile to collaborate with suppliers in setting goals regarding sustainability issues as the distance decreases.

Considering the effect of the control variables, the results indicate that as the suppliers' number of employees increases, the focal firms' tendency towards collaborative RMS increases. Although larger firms can manage sustainability issues by themselves, these results indicate that having low distance with suppliers encourages focal firms to participate more in their sustainability practices. The reason may be that, there is a high chance for larger firms to be subjected to greater public scrutiny (Jaafar & Thornton 2013). The results also reveal a negative relationship between the lengths of the relationship with the suppliers and the focal firms' use of collaborative RMS. The longer the duration of a relationship with the suppliers, the less use of a collaborative RMS by the focal firms. This may imply that focal firms with a long relationship with their suppliers establish a high level of trust, which can provide an opportunity for focal firms to reduce monitoring costs.

Previous studies identify that power is a significant factor that can affect focal firms' decision-making process regarding other firms (Alvarez, Pilbeam & Wilding 2010; Byrne & Power 2014; Meqdadi, Johnsen & Johnsen 2016; Tachizawa & Wong 2014). Power can be stemmed from the control of knowledge which is critical for firms to have influence over their SCN actors (Byrne & Power 2014). As explained in Chapter Three, this research uses five main bases of power including coercive, legitimate, reward, referent and expert power as initially suggested by French and Raven (1959) and utilized by numerous researchers (Schleper, Blome & Wuttke 2017). Thus, power

in this research means the ability of the suppliers in the SCN to influence other SCN actors due to its five main sources. However, these empirical results indicate no evidence about the relationship between power and the use of each RMS. This may imply that power can be meaningful in terms of a two-dimensional relationship such as supplier-retailer, which can be construed as dependency rather than analysing firms' power in terms of the five common sources. Considering a supplier's power in the SCN, irrespective of their relationship with its focal firms, it may not be effective for focal firms' choice of various RMS to improve sustainability of the SCN. Thus, analysing suppliers' power at the network level may not be useful in deciding appropriate RMS by focal firms to extend sustainability practices to their SCN. These results are summarised in Table 6-20.

Table 6-20. Summary of the results

The SCN structure factors						**RMS**
Supplier dependency	**Transparency**	**Distance**	**Buyer dependency**	**RE power**	**RC power**	
-	-	High	-	-	-	Non-compliance
High	High	High	Low	-	-	Transactional
High	High	-	-	-	-	Dictatorial
-	High	Low	-	-	-	Collaborative

The results of discussion in this study are also consistent with the findings of other research which have been implemented in the Australian food industry. Coles and Woolworths have initiated numerous mutual projects with their suppliers collaborating with them to ensure they look after for people, animal and environment (Lewis & Phillipov 2016). For example, Houston's Farm is a producer of high-quality bagged salad which supplies Coles and Woolworths and a number of independent supermarkets in Australia. In 2006, they were selected as Woolworth's fresh produce supplier of the year which brought them more transparency within the Australian food industry. They also have a high degree of integration with Coles and Woolworths, resulting in having good relationships, particularly in terms of developing new products with these two retailers (Bonney et al. 2007). One respondent in this study also mentioned:

> *I think both supermarkets take into consideration our requirements as a business to meet our values regarding sustainability and have agreed to purchase our goods at a fair price so that we can meet our objectives* (CEO – low distance firm).

In contrast, Coles and Woolworths force small growers to have the sustainability standards accreditation which can be very expensive (Keith 2012). According to the report generated by Friends of the Earth Australia, these farmers have difficulties to cover the costs of accreditation required by two giant retailers. They usually mention that 'Coles and Woolworths are too hard to deal with' as they use anti-competitive behaviour and coercion of suppliers to reach their objectives (Lewis & Phillipov 2016). For example, two respondents in this study also commented:

> *I think Coles and Woolworths need to realise that if they keep practicing win-lose business pressure to its suppliers eventually there will be no competition and we will only end up with their private label and the really big brands. I feel that they are somewhat like a big bully in the Australian grocery market. They demand instead of working closely with their suppliers* (Supply Chain Manager – dependent firm).

> *They require people that can communicate clearly and work together with them to help achieve the common goal required. Too often they dictate rather than educate* (Sales Manager – dependent firm).

Woolworths uses their own quality assurance and Coles combines private standards such as the British Retail Consortium with their own additional 'bolt-on' standards to strictly audit their suppliers. For example, in the case of food safety and quality, they use variety of programs such as Freshcare, SQF2000, SQF1000, HACCP, Woolworths Quality Assurance Standard (WQA), ISO 9000, EureoGAP, Enviroveg, Farmsafe (Parker 2015). Due to the asymmetrical power relationships with suppliers, both supermarkets use their power over suppliers in implementing sustainability practices and as a result, suppliers need to meet their requirements if they wish to access to these two retailers (James 2016). In some cases, suppliers need to pay for these audits and

monitoring programs by themselves which can be costly (Parker 2015), otherwise, they will lose access to around 80% of the food market in Australia (Richards & Devin 2016).

6.5 Summary

This chapter presented the second part of the data analysis and discussed the results. The objective of this chapter was related to answering the third subsidiary research question stated in Chapter One. To answer the research question, a multiple regression analysis was conducted to test the hypotheses and investigate the relationship between six independent variables related to the SCN structure and four dependent variables related to RMS.

The results indicated that distance was the only independent variable which had an effect on non-compliance RMS. This means that as a supplier's distance increases from focal firms, the focal firms may have more tendency to use a non-compliance RMS to address sustainability issues in the supplier. Regarding transactional RMS, the results indicated that three independent variables (transparency, distance, and supplier dependency) had a significant positive effect and one independent variable (buyer dependency) had a significant negative effect on transactional RMS. Meanwhile, the results related to the dictatorial RMS indicated that two independent variables, transparency and supplier dependency, can significantly affect dictatorial RMS. The direction of the relationship is positive, which means that increases in the suppliers' transparency (in the SCN) and suppliers' dependency (on focal firms) can be positively reflected in focal firms' intentions to employ dictatorial RMS for applying sustainability practices to their suppliers. The results furthermore indicated that transparency and distance have significant impacts on collaborative RMS. The direction of the relationship between transparency and collaborative RMS is positive, whereas the direction of the relationship between distance and collaborative RMS is negative.

The first part of the data analysis was related to investigating the factors related to the SCN structure and RMS (Chapter Five). In this regard, EFA was conducted on the

collected data from the web-survey and the results were discussed to answer the first and second subsidiary research questions. In the second part of the data analysis, the relationships between independent variables related to the SCN structure and dependent variables related to RMS were investigated through the multiple regression analysis and the results were discussed to answer the third subsidiary research question. The next chapter summarises the discussion at a whole thesis of level and answers the primary research question as stated in Chapter One.

CHAPTER 7 CONCLUSIONS, IMPLICATIONS, AND FUTURE RESEARCH

7.1 Introduction

This thesis conducted empirical research with the main objective of investigating the impact of the SCN structure on the types of RMS implemented by focal firms to manage sustainability issues in their SCN. The thesis began with an extensive literature review related to the SCN (Chapter Two) and the SSCM (Chapter Three). After reviewing the respective literature, a conceptual framework and consequently four hypotheses were developed to identify the relationship between the SCN structure and the RMS (see Chapter Three). To investigate the conceptual framework, a quantitative methodology through a web-based survey was developed in Chapter Four to analyse the relationships in the Australian food retail industry context. The conceptual framework was then further investigated in Chapter Five with the results generated from the web-based survey to validate the factors related to the SCN structure and RMS, and to test the hypotheses in Chapter Six.

This concluding chapter begins by summarising the research findings (both from the literature review and the empirical study) and then discussing the conceptual and managerial contribution of this research. Next, the limitations of the research will be discussed and directions for future research will be suggested.

7.2 Summary of the findings

In the last decade, incorporating sustainability into SCM has gained wide acceptance which has motivated both academic and industry experts to focus on SSCM (Busse, Meinlschmidt & Foerstl 2017; Meinlschmidt, Schleper & Foerstl 2018; Wilhelm et al. 2016). Further, focal firms need to have a broader view of their supply chain by looking at the chain from a network perspective rather than simple linear connections from initial suppliers to end customers. In reality, a SCN includes numerous actors which are interrelated in delivering the final goods or services to the end-customers (Kim et al. 2011). Thus, focal firms should consider their relationships with numerous SCN actors in terms of the sustainability of their SCN.

Establishing effective relationships with the SCN actors plays a crucial role in SSCM (Beske & Seuring 2014) as focal firms have limitations in the resources and capabilities inside their firm. This argument is supported by researchers who emphasise the important role of building relationships with various actors within the SCN since it is a significant source of competitive advantage (Chang, Chiang & Pai 2012; Roscoe, Cousins & Lamming 2016). However, close relationships are not always an appropriate type of relationship. Building and maintaining relationships (such as partnerships) with each actor can be costly (Rauer & Kaufmann 2015); therefore, firms should develop different types of RMS.

7.2.1 Findings from the literature review

The findings from the literature review suggest there are four types of RMS which focal firms apply to manage sustainability issues in their SCN. The first RMS is non-compliance. Focal firms use this RMS when they are not interested in monitoring the sustainability issues of a SCN actor. For example, the focal firms may evaluate and select their first-tier suppliers based on sustainable criteria and neglect the lower tiers. The second RMS is transactional and is concerned with monitoring minimum standards and requirements of compliance with regulations. In the sustainability practices related to this RMS, focal firms usually establish weak ties by employing arms-length interactions with SCN actors, applying short-term commitments, and exchanging a low level of information sharing. The third RMS is dictatorial, which focal firms employ when they have dominance over their SCN actors, which allow focal firms to force their SCN actors to follow their edicts. Using a dictatorial RMS, focal firms tend to impose norms, standards, and practices to manage sustainability issues within their SCN. The fourth RMS is collaborative in which focal firms and other SCN actors are working together in terms of various joint rules such as certifications, environmental management schemes, and competence enhancing compliance to improve sustainability in their firms. In other words, focal firms directly collaborate with their SCN actors to improve sustainability performance. These four types of RMS can assist focal firms in implementing their various sustainability practices within their SCN.

Finding an appropriate type of RMS regarding sustainability practices is a challenging task and can be affected by various contingency variables (Meinlschmidt, Schleper & Foerstl 2018). In particular, studies that analyse SSCM from the network perspective indicate that the focal firms need to recognise the embeddedness of themselves within a wider stakeholder network (Dou, Zhu & Sarkis 2017; Grimm, Hofstetter & Sarkis 2014; Meinlschmidt, Schleper & Foerstl 2018; Wilhelm et al. 2016). The literature indicates that the complexity of the structure of relationships between a focal firm and its SCN actors can influence the subsequent behaviour of the firm within its SCN (Grimm, Hofstetter & Sarkis 2014; Meinlschmidt, Schleper & Foerstl 2018; Roscoe, Cousins & Lamming 2016; Wilhelm et al. 2016). Thus, focal firms' choices of RMS are highly dependent on the characteristics of its SCN structure.

In deciding on an appropriate type of RMS, a focal firm needs to consider the factors affecting its SCN structure. The findings from the literature review suggest there are four factors (dependency, distance, transparency, and power) which can affect a focal firm's decisions to apply appropriate types of RMS. The first factor is dependency which is used to analyse the level of influence at the node level of a SCN. It measures the extent to which a SCN actor relies on another SCN actor in a dyadic relationship. Based on the asymmetric interdependency, dependency can be categorised into supplier dependency and buyer dependency. The former measures how much a supplier is dependent on buyers, while the latter measures how much a buyer is dependent on suppliers. The second factor is distance which is used to analyse the level of information availability at the node level since the length of the path between two SCN actors can significantly affect the exchange of information between them. The third factor is power. At the network level, power means the ability of a firm to influence other firms within its network. Unlike the dependency confined to the dyadic relationship, power resides within the network in which a firm is embedded. The fourth factor is transparency. The level of information availability at a network level is analysed through transparency which is defined as the extent of information about a SCN actor that is available to other SCN actors. Firms with largely visible brands may be subject to greater scrutiny by various stakeholders such as the public, the

media, and NGO. Accordingly, these four factors can be considered significant in affecting focal firms' choosing of sustainability practices.

7.2.2 Findings from the empirical study

To answer this thesis' research questions and validate the results from the literature review, four hypotheses were developed and tested empirically using a web-based survey involving two Australian retail food SCNs (Coles and Woolworths). By sending the questionnaire to 278 suppliers/manufacturers, 66 questionnaires were completed, with a response rate of 24%. However, as explained in section 5.2.1, the low number of received questionnaires may affect the generalisability of the findings. Thus, the extent to which the findings of the quantitative study (explained in this section) may only be limited to the number of suppliers which have answered the questionnaire in the present study, and may not be extended to the entire population.

To validate the types of variables (factors) identified for RMS and the SCN structure in the literature regarding answering SRQ1 and SRQ2, an EFA was utilised (see Chapter Five). As explained, SRQ1 is associated with the type of sustainability practices that focal firms apply to manage sustainability issues in their SCN. Data collected from the received questionnaires were analysed and accordingly, four RMS were identified. Therefore, the findings validated all four RMS identified in the literature.

SRQ2 is associated with the types of factors that can determine the structure of the SCN. Data received from the responses were considered as inputs for the EFA process and the outputs validated two factors (transparency and distance) as identified in the literature. However, dependency has been divided into two factors including supplier dependency and buyer dependency. Regarding the power, the EFA results indicated two new factors naming 'RE' power and 'RC' power rather than only one power. 'RE' power includes items related to the reference and expert power and 'RC' power contains items related to the reward and coercive power (see Chapter Five). Thus, six factors have been identified to conceptualise the SCN structure.

To find the relationship between factors related to the SCN structure and RMS, and answering SRQ3, a multiple regression analysis was used to evaluate the relationships in Chapter Six. In this regard, four multiple regression models were developed to test the hypotheses. To test the first hypothesis (dependency, distance, power and transparency influence focal firms' choice of non-compliance RMS to manage sustainability in the SCN), the results indicated that distance is the only factor that can affect non-compliance RMS. This means as the distance between a focal firm and its supplier increases, the focal firm is inclined to use non-compliance RMS regarding the sustainability of the SCN. Thus, H1 is slightly supported.

Regarding the second hypothesis (dependency, distance, power and transparency influence focal firms' choice of transactional RMS to manage sustainability in the SCN), the results showed that transparency, distance, supplier dependency and buyer dependency can affect transactional RMS. This means as the transparency of the supplier in the network increases, its focal firm shows a greater tendency to use transactional RMS to manage sustainability issues within the supplier. The motivation to apply transactional RMS can be escalated as the distance between the focal firm and the supplier increases and also when the supplier's dependency on the focal firm increases. However, as the focal firms' dependency on the supplier increases the focal firms' intentions to use transactional RMS decreases. Thus, H2 is mainly supported.

In relation to the third hypothesis (dependency, distance, power and transparency influence focal firms' choice of dictatorial RMS to manage sustainability in the SCN), the results generated from the regression model indicate that supplier dependency and transparency can affect the dictatorial RMS. This means as the dependency of the supplier on its focal firm increases, the focal firm shows a higher tendency to apply dictatorial RMS to manage sustainability issues within the supplier. This intention can be enhanced as the transparency of the supplier in the SCN increases. Thus, H3 is partially supported.

With respect to the fourth hypothesis (dependency, distance, power and transparency influence focal firms' choice of collaborative RMS to manage sustainability in the

SCN), the regression results indicate that distance and transparency can affect the collaborative RMS. This means as the distance between the focal firm and the supplier increases, the focal firm is more interested in using collaborative RMS. This motivation will be augmented as the transparency of the supplier in the SCN increases. Thus, H4 is partially supported.

The outcome of testing the four hypotheses indicates that focal firms need to consider different factors in deciding appropriate types of RMS. This means each factor related to the SCN structure can have a different effect on RMS. Thus, by measuring these factors, focal firms can identify which types of sustainability practices can be applied to manage sustainability issues within the SCN.

7.3 Contributions of the study

This study is one of the first attempts to investigate the impact of contextual factors, SCN structure, on the type of RMS that focal firms can apply to extend sustainability practices in their SCN. Incorporating sustainability into SCM has been an ongoing concern of firms in recent decades (Beske-Janssen, Johnson & Schaltegger 2015; Busse, Meinlschmidt & Foerstl 2017; Meinlschmidt, Schleper & Foerstl 2018). This mainly emanated from increasing pressure imposed by various stakeholders such as government regulators, NGOs and customers, who expect firms to have more commitment to sustainability. Therefore, this research brings this topic to attention by empirically applying the network perspective to SSCM and analysing the significant role of factors related to the SCN structure in deciding appropriate types of the RMS towards sustainability of the SCN. Using the food retail industry and considering suppliers and manufacturers as SCN actors, the findings provide useful insights into managing sustainability issues in the complex SCN. The findings reveal that to apply an effective RMS to SCN actors, focal firms need to analyse the actors' positions in the SCN structure at both node and network level. This analysis can assist focal firms towards better implementing of sustainability practices in their SCN, which may also add to academic and practitioner understanding.

7.3.1 Conceptual contributions

This research also contributes to the SSCM literature by analysing and categorising various sustainability practices, which focal firms apply to manage sustainability issues in their suppliers. Extending appropriate types of sustainability practices into the SCN based on the contextual factors has been a great challenge for researchers (Meinlschmidt, Schleper & Foerstl 2018; Wilhelm et al. 2016; Tachizawa & Wong 2014). Through analysing the SCN, this research provides researchers with useful insights into the RMS implemented by focal firms to improve the sustainability of their SCN, which have been neglected in the SSCM literature (Meinlschmidt, Schleper & Foerstl 2018). Various types of sustainability practices and six contextual factors have been examined and validated by an empirical study, which have not been examined by previous research. The empirical results identify five factors (transparency, power, supplier dependency, buyer dependency, and distance) for the SCN structure and also present two new factors (RC power and RE power instead of power) that were not considered in the pre-conceptualisation of the SCN structure. Identifying these new factors can be considered a unique contribution of this research. In addition, four RMS (non-compliance, transactional, dictatorial, and collaborative) were identified and validated by an empirical research, which has not been sufficiently examined by prior studies. Accordingly, the results contribute to the SSCM literature by categorising different types of sustainability practices within the four distinct RMS. More importantly, the conceptual framework highlights that the focal firms need to consider the impact of the SCN structure on the RMS to improve the sustainable development objectives in their SCN, which has not been thoroughly explored. This means that the focal firm can use the model to decide on the specific structure in its SCN, and which appropriate types of sustainability practices have to be employed in which business processes.

These findings bring several valuable contributions to SSCM. Firstly, this research partially extends the recent works of Meinlschmidt, Schleper and Foerstl (2018), Tachizawa and Wong (2014), and Wilhelm et al. (2016) by focusing on empirically testing how the SCN structure influences different RMS to improve sustainability of

the SCN. The findings indicate that non-compliance RMS can be positively affected by distance; transactional RMS can be positively affected by transparency, distance, and supplier dependency, and negatively affected by buyer dependency; dictatorial RMS can be positively affected by transparency and supplier dependency; and finally, collaborative RMS can be positively affected by transparency and negatively affected by distance. Secondly, this research can be considered as complementary to the work of Awaysheh and Klassen (2010) by analysing the supply chain structure from the network perspective and providing a comprehensive understanding of existing sustainability practices that focal firms employ via different RMS. However, similar to their findings, this research identifies that the extra factor (power) does not affect the decision of the focal firms in diffusing sustainability practices in the SCN. Finally, this research partially extends the work of Vurro, Russo and Perrini (2009) by investigating the impact of SCN structure on the types of governance mechanisms (RMS in this research).

In addition, this research develops a unique procedure (see Chapter Four) to identify sample size in studies designed to be empirically implemented in SCN. Considering that networks are borderless, researchers face challenges to "read the network" and distinguish between actors in the network context, network horizon, and network environment (Holmen & Pedersens 2003, p. 409). Actors in the network context are related to the focal firm, while in the network horizon may or may not be related to the focal firm. Actors in the network environment are not recognised by the focal (Holmen & Pedersens 2003). This research used this procedure to identify and validate the sample size as it can increase the chance of identifying the related actors in a network. Other researchers can apply this procedure to obtain a comprehensive view of their sample size within a network. However, the procedure may need to be tested and validated in the future research as it does not happen to have been used in the literature.

7.3.2 Managerial contributions

The findings from this research can provide useful considerations for both managers of focal firms and suppliers. Firstly, by analysing the position of various types of actors

(such as customers, manufacturers, suppliers, NGO) in the SCN via the four identified factors related to the SCN structure (supplier dependency, buyer dependency, distance, transparency), the managers can identify the key network actors that can have a considerable impact on the sustainability of the SCN. Each SCN actor may, for example, have different impact on the sustainability performance of the focal firms such as how suppliers with a high visibility (transparency) can affect the sustainability of the SCN by revealing information to other actors in the SCN. By identifying these suppliers in the network, managers can facilitate the process of improving sustainability by promoting appropriate types of relationships such as partnerships and joint initiatives related to sustainable development objectives. Having mutual sustainability-related projects in different contexts can be beneficial for both involved parties (focal firm and its SCN actor) as seen, for example, by how marketing managers can benefit from collaborating with the potential suppliers to make sustainable new product development decisions. As developing new products is costly and needs a substantial investment of time and resources, focal firms can support the required investment (for example, see Melander, Rosell & Lakemond 2014) with the help of their suppliers, resulting in a durable presence in the market. This form of relationship can influence the effectiveness of new product development projects, leading to a greater return on investment over the long term.

Secondly, it may be prudent for the focal firms to identify 'lower tier' actors because moving towards sustainable development objectives increasingly shifts to managing sustainability issues beyond the focal firms (Meinlschmidt, Schleper & Foerstl 2018). Some SCN actors' non-compliance with sustainability standards, however, may create a negative public image for customers who can hold the focal firms accountable for such misbehaviour. Of interest is that frequently, these non-sustainable actions are conducted at the sub-actor level (Wilhelm et al. 2016). At first glance, these actors may seem peripheral in the SCN, but by examining them deeply via the five identified factors related to the SCN structure, some of these actors may become key players. For example, some suppliers may have numerous links (information flow and material flow) with key actors (such as competitors, NGOs) in the SCN. These suppliers may

be quite remote from focal firms or may not be very dependent on them, however, they may be critical actors. Two examples of this are where suppliers have a relationship with competitors or may be too transparent due to having a relationship with prominent NGOs in the SCN. These supplier characteristics can be a potential opportunity for focal firms to employ a specific RMS to exert some control over them in managing sustainability issues. By identifying these actors, managers can identify new developments in the industry in terms of sustainability issues undertaken by other focal firms (competitors) in the SCN whilst protecting their firms from negative publicity created by inappropriate behaviours. In other words, some actors neglected by focal firms may emerge as increasingly important and critical for other key actors in the SCN. These actors could be the main target for the focal firm to establish a quality relationship that enables the management of sustainability issues.

Thirdly, the relationship management literature has largely concentrated on long-term relationships, highlighting the necessary requirements on how to achieve a long-term exchange (Dimyati & Subagio 2018; Mysen, Svensson & Högevold 2012). However, to improve sustainability of the SCN, the focal firm may not apply sustainability practices to each individual actor by having a close relationship within the SCN because of the costs associated with practices and it being nearly impossible to manage thousands of low tier actors in relation to sustainability issues (Rauer & Kaufmann 2015). The high upfront cost of sustainability practices can also be considered an important barrier to implementing SSCM (Walker, Sisto & McBain 2008). Using the findings can encourage further discussion and assist managers in reducing the cost barrier by allocating the right practices for the right actors through the adoption of an appropriate RMS. By analysing each actor's position in relation to each of the five identified factors within the SCN structure, focal firms can implement such practices in a cost-effective manner. For example, the focal firm may focus on reinforcing a relationship with the legitimate actors such as an NGO (e.g. Greenpeace) through collaborative projects, thus offering natural solutions which may have considerable costs. These types of costs can be justified since being connected with legitimate actors can provide more sustainable legitimacy for focal firms (Kishna et al. 2017). This is

also helpful for multinational companies, which are dealing with the increased complexity of allocating adequate investment to manage their global sourcing and marketing activities. In this way, the focal firms can leverage stakeholder pressures in terms of sustainable supply chain activities effectively.

Fourthly, focal firms can change the structure of the SCN in favour of applying a specific RMS to a SCN actor. The different structure may require different strategies by focal firms to cope with sustainability issues in the SCN (Tachizawa & Wong 2014). Building a close relationship, however, is not always the best RMS because, for example, some focal firms may not need or want to establish close relationships with all of their suppliers. The findings provide four RMS, which focal firms can apply according to their SCN structure. The transition between different RMS can be possible as the focal firms have the ability to remodel the SCN structure or the pattern of interactions with their SCN actors. For example, by identifying more alternative suppliers (that have reputations in the following sustainability standards) for bottleneck products (Kraljic 1983), the focal firms can find more leeway in choosing a different RMS. By doing this, the focal firms can change the dependency factor in the SCN structure. This means adding new legitimate suppliers to the supply base decreases the focal firm's dependency on the previous suppliers which results in reducing the complexity of the supply. In this new situation, the focal firm may use a different RMS that needs less time and effort than a traditional one to follow sustainability issues with the previous suppliers, which may have no intention of adopting sustainability standards, and instead build a closer relationship with the new legitimate suppliers. Thus, the focal firms can employ their desired RMS based on changing the pattern of interactions in the SCN structure by focusing on the five identified factors.

Fifthly, similar to the focal firms, SCN actors can also analyse their overall network position in the SCN and shape it based on their strategic actions. The different types of relationships that a SCN actor maintains with other SCN actors particularly with focal firms will, in turn, influence the degree of involvement and how they interact and negotiate over time (Håkansson & Ford 2002). However, an existing SCN

structure can be considered as the main constraint for SCN actors in aligning with their focal firms' intentions towards more collaboration (Gualandris & Pagell 2015). In this way, the SCN actors can overcome this constraint by analysing the shape of the SCN structure with the five identified factors. For example, they can change the configuration of the interactions to receive more attention from their focal firms. Managers can work on the SCN structure by decreasing the distance with their key customers to facilitate the level of information exchange that can result in better communication. Through implementing business to business infrastructure, they can provide a better base for establishing a close relationship with their key customers. As a result, the SCN actors can benefit from the extensive knowledge, joint learning and the provision of technical assistance by the focal firms regarding the sustainability issues and improve themselves in this area, which may result in a new source of income. In doing so, the findings provide managers with guidelines to help them make informed strategic decisions regarding the effective diffusion of sustainability practices throughout their SCN and enable improved understanding and management of the nuances in adopting RMS.

7.4 Limitations of this research

As with all research, this thesis also has limitations. The first limitation is related to the web-based survey which was used to collect data. According to the literature, using a web-based survey can bring several limitations in terms of uncertainty regarding the type of respondents, coverage, and reliance on software (Stern, Bilgen & Dillman 2014). Results from the web-based survey can also be trustworthy (Callegaro, Manfreda & Vehovar 2015). Considering the resource and time limitations in this study, a web-based survey was selected as it provides more flexibility and accessibility to numerous actors within a complex SCN. However, having a low number of received questionnaires may compromise the generalisability of the findings and can be considered as a limitation for this research. Since the population for this study is the number of suppliers who directly work for Coles and/or Woolworths (section 4.7.3.1), this study cannot adjust the assessment of the population downwards based on demographic questions because of the nature of the database of this study. The

suppliers that the questionnaires are received from them are all from different size, location, years of relationship with Coles and Woolworths. As there is no official website to provide data regarding the number of suppliers for Coles and/or Woolworths (section 4.7.3.1), it is not possible to have statements such as the population for this study is 'only suppliers that are located in Australia' or 'suppliers that are medium size'. The reason is that, there is no official database providing this information. This means the identified factors (Chapter Five) and the relationship between them (Chapter Six) cannot be considered as fully generalisable and entirely applicable to all the relationships between focal firms and suppliers.

The second limitation is related to the sampling technique used to identify actors in the Coles and Woolworths' SCN. As there was no official website that provides information about the suppliers/manufacturers that are working with Coles and Woolworths, the exact number of population for this research was not determined. However, by using these two retailers' shopping websites, manufacturers and suppliers are identified which was considered as a population number. To reduce the risk of missing suppliers and manufacturers from the population, the initial list was triangulated with social media platforms such as LinkedIn and other official websites such as Company 360.

The third limitation is related to the type of supplier informant. In the questionnaire, three types of questions were asked from the respondents. The first type concentrated on suppliers' positions within the business network. The second type focused on the type of sustainability practices that suppliers apply to their supply chain, and the third type was associated with the type of RMS that Coles and Woolworths apply to manage sustainability issues within the supplier. Thus, based on the nature of the questions, the informants required knowledge of their business network, sustainability practices, and RMS with Coles and/or Woolworths. Finding informants with sufficient knowledge in such areas was a challenging task. However, this research postulated that the targeted senior managers working in the SCs (such as supply chain managers, production managers, operation managers) have the required knowledge to complete the questionnaires.

The fourth limitation is related to the generalisability of the findings. Due to the limitations of time and resources, this study focused on surveying suppliers and manufacturers working in two Australian food retailers (Coles and Woolworths), which may have posed some generalisability issues. However, the Australian food retail industry is highly concentrated and these two large retailers account for the majority of the market share. They have a complex SCN and have initiated sustainability practices in their SCN. In addition, the targeted respondents have a high status in their organisations who provide valuable insights into the research questions. These characteristics provide a good empirical environment and therefore, helped this research to test the conceptual framework empirically.

The fifth limitation is related to the type of respondent. Due to the lack of interest from the management team in Coles and Woolworths, no-one from these retailers was surveyed. Although attempts have been made to mitigate this limitation, no responses were received from them. In this regard, numerous suppliers in their SCN are targeted to identify the focal firms' approach to improve sustainability in the SCN. Thus, the results of this empirical study are all from the perception of the suppliers in the SCN without inputs from the two focal firms

The sixth limitation may be related to respondents' potential fears of disclosing information, particularly in the section related to their relationship with Coles and Woolworths. The second part of the questionnaire consists of questions about RMS that are implemented by Coles and Woolworths respectively to extend sustainability practices to their suppliers. There was a perception that suppliers were reluctant to provide insights as they might think that this information would be shared with the two retailers. To reduce the risk of withholding information by suppliers, this research made endeavours such as highlighting that the responses will be treated as strictly confidential, and the identity and the name of their firms will be kept anonymous in the invitation email, information sheet, and the questionnaire. It was also mentioned that this research is for academic purposes and it is not associated or sponsored by Coles or Woolworths. However, the perception of fear of disclosing information might

be present as the completion rate for the related questions was low, which was considered natural based on the context of the research.

7.5 Directions for future research

This section provides some directions that researchers may use for their future SCM research. Firstly, the conceptual framework was tested through a web-based survey in the Australian food industry. Six factors related to the SCN structure and four RMS are identified, and the relationships between them were evaluated. There is now an opportunity for future research to test the model in a different industry as each industry may have their own specific sustainability practices which can affect the result. In this way, researchers may find different factors, types of RMS, and different relationships between them. Similar to the industry type, collecting data from a different country can also be a good avenue for future studies as each country has their own rules and regulations regarding implementing sustainability practices. Therefore, a comparison can be made with implementing sustainability practices in other parts of the world or other industries regarding focal firms' decision-making processes in choosing appropriate types of RMS to manage sustainability issues with the SCN.

Secondly, future research could consider how focal firms are positioned in their SCN, which can affect the ability of the focal firms to diffuse sustainability practices throughout their SCN (Tachizawa & Wong 2014). This research mainly explored the large firms' different applications of sustainability practices and how they interact with their different SCN actors. However, the impact of the patterns of interactions among various SCN actors on the focal firms' positions could be an opportunity for the future research. Using theories and methods such as social network analysis (Chang, Chiang & Pai 2012; Wichmann & Kaufmann 2016) would allow researchers to analyse the central position of the focal firms in their SCN and the distribution of the power among SCN actors, as well as potentially validate this research's conceptual framework by providing metrics that could be quantified, analysed and visualised.

Thirdly, the role of the SCN structure in choosing appropriate types of RMS to implement related sustainability practices was reviewed in the literature and tested in

the two Australian food retailers' SCNs and the results of the empirical study were all from the perception of the suppliers in the SCN without inputs from the two focal firms. Looking at the SCN from the focal firms' perspective, for example, by conducting in-depth case studies can provide more answers to the questions of why and how sustainability practices are diffused into the SCN. In addition, having responses from both sides (suppliers and retailers) will assist in making comparisons between the results generated from suppliers' and buyers' perspectives, which will contribute to the literature in this context.

Finally, this research drew samples from suppliers and manufactures in the focal firms' SCNs. As explained in Chapter Two, a SCN consists of numerous actors (both firms and non-firms) in different contexts which are interrelated. These interconnections among the SCN actors and the configuration of the SCN can make a significant impact on the focal firms' decision-making processes, particularly to improve sustainability of the SCN which should be considered. Thus, future directions are suggested to include a variety of SCN actors such as government agencies, logistics companies, distribution companies, and NGOs, and investigate how focal firms treat these actors to manage the sustainability of their SCN.

7.6 Concluding comments

The purpose of this thesis was to investigate how a SCN structure affects RMS to employ sustainability practices within the SCN. The relationship between SCN structure and RMS remains an under-researched but emerging area of interest. This thesis is one of the few studies with an explicit conceptual framework linking the SCN structure and RMS within SSCM. The conceptual framework leverages existing research in SSCM and SCN literatures to develop a suitable analytical basis for empirical testing. In addition, this thesis is among the few empirical works examining the impact of SCN structure on RMS in SSCM, which provides new insights into the implementation of sustainability practices in the SCN. For focal firms with a complex SCN, this thesis suggests pragmatic solutions in balancing their efforts to manage sustainability practices in various suppliers. Furthermore, the contribution of this

research can assist further research to observe the application of sustainability practices in the SCN.

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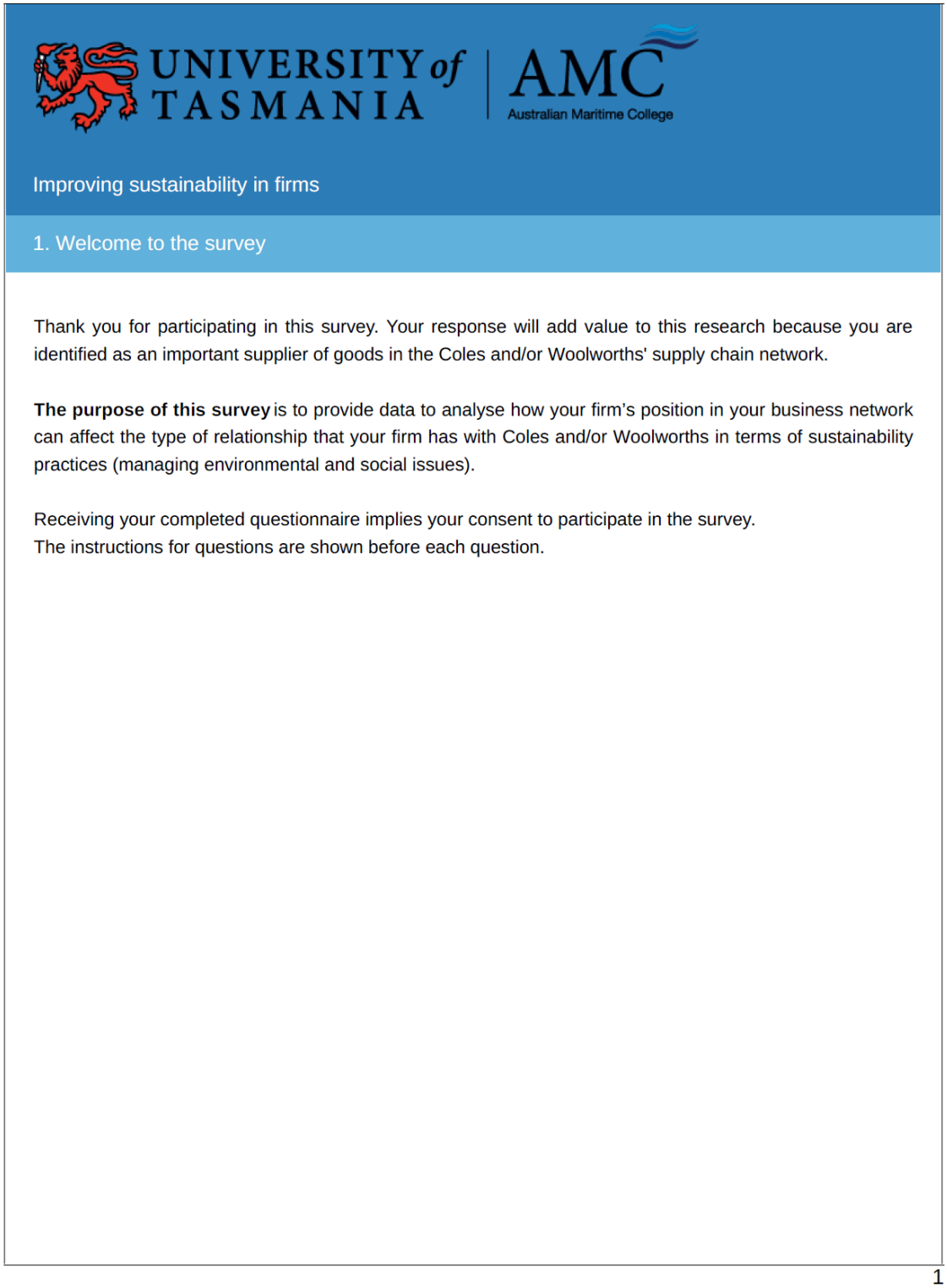
Appendix A: Questionnaire



Improving sustainability in firms

2. Questions about you

1. What is your job title?

- ◯ Chief Executive Officer or Managing Director
- ◯ Supply chain manager
- ◯ Production manager
- ◯ Sales manager
- ◯ Account manager
- ◯ Other (please specify)

2. How many employees (by headcount) are employed by your firm?

- ◯ 0-19
- ◯ 20-49
- ◯ 50-99
- ◯ 100-199
- ◯ 200-499
- ◯ 500 or more

3. How many years has it been since your firm was founded?

- ◯ 0-5
- ◯ 6-9
- ◯ 10 -19
- ◯ 20-29
- ◯ 30 or more

4. What is the approximate annual turnover of your firm? (Both sales within your country and export)

- ◯ Less than $500,000 (AUD)
- ◯ Over $500,000 to $2 million (AUD)
- ◯ Over $2 million to $10 million (AUD)
- ◯ Over $10 million to $50 million (AUD)
- ◯ Over $50 million (AUD)
- ◯ Prefer not to indicate

5. In which country is your firm's head office located?

- ◯ Australia
- ◯ New Zealand
- ◯ Other (please specify)

3

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Improving sustainability in firms

3. Firms' position in the business network

6. This question examines how much **information** about your firm is available to other firms in your **business network**. A business network includes customers, suppliers, distributors, competitors, third parties, and others, which can affect your firm's various activities.

Please click the extent to which you agree or disagree with the following statements regarding your firm's position in your business network. Please click 'Not applicable' when a question does not apply to your case and click 'Don't know' when you do not have information about it.

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
6-1) Firms in our business network know how our products are produced.	○	○	○	○	○	○	○	○	○
6-2) Firms in our business network can track our products from raw materials to the end customers.	○	○	○	○	○	○	○	○	○
6-3) Firms in our business network can find information about our suppliers.	○	○	○	○	○	○	○	○	○
6-4) Firms in our business network know about the types of raw materials/components in our products.	○	○	○	○	○	○	○	○	○
6-5) Firms in our business network know our brand names.	○	○	○	○	○	○	○	○	○

Please provide information in the comment block if you wish to explain more about any of the items, For example, how can these items affect your availability of information?

4

7. This question examines how much**influence** your firm has over other firms in your**business network**.

Please click the extent to which you agree or disagree with the following statements regarding your firm's position in your business network.

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
7-1) We provide good advice to firms in our business network about their products/services.	○	○	○	○	○	○	○	○	○
7-2) Firms in our business network find the knowledge of our experts about their products/services valuable.	○	○	○	○	○	○	○	○	○
7-3) Firms in our business network are proud to be closely associated with us.	○	○	○	○	○	○	○	○	○
7-4) Firms in our business network admire us as an attractive reputational resource.	○	○	○	○	○	○	○	○	○
7-5) Firms in our business network comply with our requests, even if there is no contract between us.	○	○	○	○	○	○	○	○	○
7-6) We expect firms in our business network to accommodate our request, even if there is no contract between us.	○	○	○	○	○	○	○	○	○
7-7) We can offer incentives to firms in our business network so they comply with our requests.	○	○	○	○	○	○	○	○	○
7-8) Firms in our business network cooperate in implementing a new practice if we provide incentives.	○	○	○	○	○	○	○	○	○
7-9) We have the ability to impose penalties on firms in our business network if they do not accept our requests.	○	○	○	○	○	○	○	○	○
7-10) We are not treating firms in our business network very well if they do not accept our requests.	○	○	○	○	○	○	○	○	○

Please provide information in the comment block if you wish to explain more about any of the items, For example, how can these items affect your level of influence?

8. What factors affect your firm's position within your business network? Why?

5

Improving sustainability in firms

4. Identifying the main retailers

* 9. Please indicate with which of these two key retailers your firm has a relationship.

- ◯ Coles (please go to pages 17-21 and then page 27)
- ◯ Woolworths (please go to pages 22-27)
- ◯ Both Coles and Woolworths (please go to pages 7-16 and then page 27)

6

Improving sustainability in firms

5. Firms' position and sustainability practices with Coles.

Questions will be first about your relationship with Coles and then will be repeated for Woolworths.

10. How many years has your firm been in a business relationship with **Coles**?

- ◯ 0-5
- ◯ 6-9
- ◯ 10-19
- ◯ 20-29
- ◯ 30 or more
- ◯ Don't know

11. This question examines the level of importance of your firm's relationship with **Coles?**

Please click the extent to which you agree or disagree with the following statements regarding your firm's position in **Coles**' supply chain.

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
11-1) We have difficulties making our business work if we decide to stop working with Coles.	◯	◯	◯	◯	◯	◯	◯	◯	◯
11-2) It would take a long time to replace Coles with new retailers.	◯	◯	◯	◯	◯	◯	◯	◯	◯
11-3) We find it very costly to replace Coles with new retailers.	◯	◯	◯	◯	◯	◯	◯	◯	◯
11-4) Our sales significantly decrease if Coles does not sell our products well.	◯	◯	◯	◯	◯	◯	◯	◯	◯
11-5) Our sales significantly decrease if Coles does not buy our products any longer.	◯	◯	◯	◯	◯	◯	◯	◯	◯
11-6) Having a good relationship with Coles is critical in our overall business.	◯	◯	◯	◯	◯	◯	◯	◯	◯
11-7) If we do not sell our products to Coles, they find it difficult to substitute our products.	◯	◯	◯	◯	◯	◯	◯	◯	◯
11-8) It would be difficult for Coles to stop working with us.	◯	◯	◯	◯	◯	◯	◯	◯	◯
11-9) Coles do not have alternatives to our products.	◯	◯	◯	◯	◯	◯	◯	◯	◯

Please provide information in the comment block if you wish to explain more about any of the items, For example, how can these items affect your level of importance?

12. Overall, how important is **Coles** for your firm's business?

Please explain why

8

13. This question examines the extent of your firm's relationship with **Coles** ?

Please click the extent to which you agree or disagree with the following statements regarding your firm's position in **Coles**' supply chain.

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
13-1) It takes too much time to schedule a face-to-face meeting with Coles.	○	○	○	○	○	○	○	○	○
13-2) We find it very costly to hold a face-to-face meeting with Coles.	○	○	○	○	○	○	○	○	○
13-3) We do not exchange critical information about our products with Coles.	○	○	○	○	○	○	○	○	○
13-4) Exchanging information about our products with Coles is difficult.	○	○	○	○	○	○	○	○	○
13-5) The organisational cultures (such as values, beliefs, and assumptions) of our firm and Coles are different.	○	○	○	○	○	○	○	○	○
13-6) The communication tools we use are different to Coles.	○	○	○	○	○	○	○	○	○

Please provide information in the comment block if you wish to explain more about any of the items, For example, how can these items affect the extent of the relationship?

14. What factors affect your firm's position within the **Coles**' supply chain? Why?

15. This question examines the **relationship** between your firm and **Coles** in terms of **sustainability practices**.

Sustainability practices within an organisation refer to managing how the organisation's activities impact on the **community** (such as safe working conditions, legal requirements, child labour, etc) and the **environment** (such as reducing greenhouse gas emissions, focusing on waste reduction, recycling, etc).

Please click the extent to which you agree or disagree with the following statements regarding your firm's relationship with **Coles.**

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
15-1) Coles has no interest in addressing sustainability issues (such as water conservation, recycling, workforce right) of our firm's practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-2) We do not need to report our sustainability practices to Coles or its representatives.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-3) Our sustainability practices are valuable for Coles.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-4) Coles only asks us to meet minimum requirements of sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-5) Coles uses external sources such as its suppliers, or other third parties to audit or evaluate our sustainability practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-6) We have a low level of information sharing with Coles in terms of sustainability practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-7) Coles audits our sustainability practices by its own auditors.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-8) Coles audits our sustainability practices regularly.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-9) Coles is able to terminate the relationship with us in the case of non-compliance with sustainability standards (such as codes of conduct).	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-10) Coles urges us to follow its own sustainability standards.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-11) Coles imposes sustainability standards on our firm.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-12) Coles provides us a list of pre-approved suppliers and asks us to source our components and materials from them.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-13) Coles urges us to initiate sustainability practices irrespective of our constraints.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-14) Coles collaborates with us in setting goals regarding sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-15) There is a close cooperation between our firm and Coles in implementing sustainability practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-16) Coles provides education to our personnel to improve their knowledge in managing sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-17) Coles provides assistance to our personnel to improve their knowledge and skills in managing sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-18) There are many joint activities between Coles and our firm to manage sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
15-19) Coles directly involves us in various practices related to sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯

Please provide information in the comment block if you wish to explain more about any of the items, For example, how can these items affect the relationship?

16. What other types of practices does your firm and **Coles** perform together to manage sustainability issues within your business?

17. Aside from existing sustainability practices in your firm, what other practices do you think **Coles** can initiate to improve sustainability in your firm that would be beneficial for both firms? Why?

18. How does your firm's position in the business network affect the type of sustainability practices between your firm and **Coles**?

Improving sustainability in firms

6. Firms' position and sustainability practices with Woolworths.

Now, we turn our attention away from Coles and the same types of questions will be repeated for Woolworths.

19. How many years has your firm been in a business relationship with**Woolworths**?

- ◯ 0-5
- ◯ 6-9
- ◯ 10-19
- ◯ 20-29
- ◯ 30 or more
- ◯ Don't know

20. This question examines the level of importance of your firm's relationship with **Woolworths?**

Please click the extent to which you agree or disagree with the following statements regarding your firm's position in **Woolworths**' supply chain.

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
20-1) We have difficulties making our business work if we decide to stop working with Woolworths.	◯	◯	◯	◯	◯	◯	◯	◯	◯
20-2) It would take a long time to replace Woolworths with new retailers.	◯	◯	◯	◯	◯	◯	◯	◯	◯
20-3) We find it very costly to replace Woolworths with new retailers.	◯	◯	◯	◯	◯	◯	◯	◯	◯
20-4) Our sales significantly decrease if Woolworths does not sell our products well.	◯	◯	◯	◯	◯	◯	◯	◯	◯
20-5) Our sales significantly decrease if Woolworths does not buy our products any longer.	◯	◯	◯	◯	◯	◯	◯	◯	◯
20-6) Having a good relationship with Woolworths is critical in our overall business.	◯	◯	◯	◯	◯	◯	◯	◯	◯
20-7) If we do not sell our products to Woolworths, they find it difficult to substitute our products.	◯	◯	◯	◯	◯	◯	◯	◯	◯
20-8) It would be difficult for Woolworths to stop working with us.	◯	◯	◯	◯	◯	◯	◯	◯	◯
20-9) Woolworths do not have alternatives to our products.	◯	◯	◯	◯	◯	◯	◯	◯	◯

Please provide information in the comment block if you wish to explain more about any of the items, For example, how can these items affect your level of importance?

21. Overall, how important is **Woolworths** for your firm's business?

Please explain why

13

22. This question examines the extent of your firm's relationship with **Woolworths**?

Please click the extent to which you agree or disagree with the following statements regarding your firm's position in **Woolworths**' supply chain.

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
22-1) It takes too much time to schedule a face-to-face meeting with Woolworths.	○	○	○	○	○	○	○	○	○
22-2) We find it very costly to hold a face-to-face meeting with Woolworths.	○	○	○	○	○	○	○	○	○
22-3) We do not exchange critical information about our products with Woolworths.	○	○	○	○	○	○	○	○	○
22-4) Exchanging information about our products with Woolworths is difficult.	○	○	○	○	○	○	○	○	○
22-5) The organisational cultures (such as values, beliefs, and assumptions) of our firm and Woolworths are different.	○	○	○	○	○	○	○	○	○
22-6) The communication tools we use are different to Woolworths.	○	○	○	○	○	○	○	○	○

Please provide information in the comment block if you wish to explain more about any of the items, For example, how can these items affect the extent of the relationship?

23. What factors affect your firm's position within the **Woolworths**' supply chain? Why?

24. This question examines the **relationship** between your firm and **Woolworths** in terms of **sustainability practices**.

Sustainability practices within an organisation refer to managing how the organisation's activities impact on the **community** (such as safe working conditions, legal requirements, child labour, etc) and the **environment** (such as reducing greenhouse gas emissions, focusing on waste reduction, recycling, etc).

Please click the extent to which you agree or disagree with the following statements regarding your firm's relationship with **Woolworths.**

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
24-1) Woolworths has no interest in addressing sustainability issues (such as water conservation, recycling, workforce right) of our firm's practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-2) We do not need to report our sustainability practices to Woolworths or its representatives.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-3) Our sustainability practices are valuable for Woolworths.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-4) Woolworths only asks us to meet minimum requirements of sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-5) Woolworths uses external sources such as its suppliers, or other third parties to audit or evaluate our sustainability practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-6) We have a low level of information sharing with Woolworths in terms of sustainability practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-7) Woolworths audits our sustainability practices by its own auditors.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-8) Woolworths audits our sustainability practices regularly.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-9) Woolworths is able to terminate the relationship with us in the case of non-compliance with sustainability standards (such as codes of conduct).	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-10) Woolworths urges us to follow its own sustainability standards.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-11) Woolworths imposes sustainability standards on our firm.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-12) Woolworths provides us a list of pre-approved suppliers and asks us to source our components and materials from them.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-13) Woolworths urges us to initiate sustainability practices irrespective of our constraints.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-14) Woolworths collaborates with us in setting goals regarding sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-15) There is a close cooperation between our firm and Woolworths in implementing sustainability practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-16) Woolworths provides education to our personnel to improve their knowledge in managing sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-17) Woolworths provides assistance to our personnel to improve their knowledge and skills in managing sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
24-18) There are many joint activities between Woolworths and our firm to manage sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
24-19) Woolworths directly involves us in various practices related to sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯

Please provide information in the comment block if you wish to explain more about any of the items, For example, how can these items affect the relationship?

25. What other types of practices does your firm and**Woolworths** perform together to manage sustainability issues within your business?

26. Aside from existing sustainability practices in your firm, what other practices do you think **Woolworths** can initiate to improve sustainability in your firm that would be beneficial for both firms? Why?

27. How does your firm's position in the business network affect the type of sustainability practices between your firm and **Woolworths**?

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Improving sustainability in firms

7. Firms' position and sustainability practices with Coles.

28. How many years has your firm been in a business relationship with **Coles**?

- ◯ 0-5
- ◯ 6-9
- ◯ 10-19
- ◯ 20-29
- ◯ 30 or more
- ◯ Don't know

29. This question examines the level of importance of your firm's relationship with **Coles?**

Please click the extent to which you agree or disagree with the following statements regarding your firm's position in **Coles**' supply chain.

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
29-1) We have difficulties making our business work if we decide to stop working with Coles.	◯	◯	◯	◯	◯	◯	◯	◯	◯
29-2) It would take a long time to replace Coles with new retailers.	◯	◯	◯	◯	◯	◯	◯	◯	◯
29-3) We find it very costly to replace Coles with new retailers.	◯	◯	◯	◯	◯	◯	◯	◯	◯
29-4) Our sales significantly decrease if Coles does not sell our products well.	◯	◯	◯	◯	◯	◯	◯	◯	◯
29-5) Our sales significantly decrease if Coles does not buy our products any longer.	◯	◯	◯	◯	◯	◯	◯	◯	◯
29-6) Having a good relationship with Coles is critical in our overall business.	◯	◯	◯	◯	◯	◯	◯	◯	◯
29-7) If we do not sell our products to Coles, they find it difficult to substitute our products.	◯	◯	◯	◯	◯	◯	◯	◯	◯
29-8) It would be difficult for Coles to stop working with us.	◯	◯	◯	◯	◯	◯	◯	◯	◯
29-9) Coles do not have alternatives to our products.	◯	◯	◯	◯	◯	◯	◯	◯	◯

Please provide information in the comment block if you wish to explain more about any of the items, For example, how can these items affect your level of importance?

30. Overall, how important is **Coles** for your firm's business?

Please explain why

31. This question examines the extent of your firm's relationship with **Coles** ?

Please click the extent to which you agree or disagree with the following statements regarding your firm's position in **Coles**' supply chain.

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
31-1) It takes too much time to schedule a face-to-face meeting with Coles.	◯	◯	◯	◯	◯	◯	◯	◯	◯
31-2) We find it very costly to hold a face-to-face meeting with Coles.	◯	◯	◯	◯	◯	◯	◯	◯	◯
31-3) We do not exchange critical information about our products with Coles.	◯	◯	◯	◯	◯	◯	◯	◯	◯
31-4) Exchanging information about our products with Coles is difficult.	◯	◯	◯	◯	◯	◯	◯	◯	◯
31-5) The organisational cultures (such as values, beliefs, and assumptions) of our firm and Coles are different.	◯	◯	◯	◯	◯	◯	◯	◯	◯
31-6) The communication tools we use are different to Coles.	◯	◯	◯	◯	◯	◯	◯	◯	◯

Please provide information in the comment block if you wish to explain more about any of the items, For example, how can these items affect the extent of the relationship?

32. What factors affect your firm's position within the **Coles**' supply chain? Why?

33. This question examines the **relationship** between your firm and **Coles** in terms of **sustainability practices**.

Sustainability practices within an organisation refer to managing how the organisation's activities impact on the **community** (such as safe working conditions, legal requirements, child labour, etc) and the **environment** (such as reducing greenhouse gas emissions, focusing on waste reduction, recycling, etc).

Please click the extent to which you agree or disagree with the following statements regarding your firm's relationship with **Coles.**

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
33-1) Coles has no interest in addressing sustainability issues (such as water conservation, recycling, workforce right) of our firm's practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-2) We do not need to report our sustainability practices to Coles or its representatives.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-3) Our sustainability practices are valuable for Coles.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-4) Coles only asks us to meet minimum requirements of sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-5) Coles uses external sources such as its suppliers, or other third parties to audit or evaluate our sustainability practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-6) We have a low level of information sharing with Coles in terms of sustainability practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-7) Coles audits our sustainability practices by its own auditors.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-8) Coles audits our sustainability practices regularly.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-9) Coles is able to terminate the relationship with us in the case of non-compliance with sustainability standards (such as codes of conduct).	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-10) Coles urges us to follow its own sustainability standards.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-11) Coles imposes sustainability standards on our firm.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-12) Coles provides us a list of pre-approved suppliers and asks us to source our components and materials from them.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-13) Coles urges us to initiate sustainability practices irrespective of our constraints.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-14) Coles collaborates with us in setting goals regarding sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-15) There is a close cooperation between our firm and Coles in implementing sustainability practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-16) Coles provides education to our personnel to improve their knowledge in managing sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-17) Coles provides assistance to our personnel to improve their knowledge and skills in managing sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-18) There are many joint activities between Coles and our firm to manage sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
33-19) Coles directly involves us in various practices related to sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯

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Please provide information in the comment block if you wish to explain more about any of the items, For example, how can these items affect the relationship?

34. What other types of practices does your firm and **Coles** perform together to manage sustainability issues within your business?

35. Aside from existing sustainability practices in your firm, what other practices do you think **Coles** can initiate to improve sustainability in your firm that would be beneficial for both firms? Why?

36. How does your firm's position in the business network affect the type of sustainability practices between your firm and **Coles**?

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8. Firms' position and sustainability practices with Woolworths.

37. How many years has your firm been in a business relationship with**Woolworths**?

- ◯ 0-5
- ◯ 6-9
- ◯ 10-19
- ◯ 20-29
- ◯ 30 or more
- ◯ Don't know

38. This question examines the level of importance of your firm's relationship with **Woolworths?**

Please click the extent to which you agree or disagree with the following statements regarding your firm's position in **Woolworths**' supply chain.

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
38-1) We have difficulties making our business work if we decide to stop working with Woolworths.	○	○	○	○	○	○	○	○	○
38-2) It would take a long time to replace Woolworths with new retailers.	○	○	○	○	○	○	○	○	○
38-3) We find it very costly to replace Woolworths with new retailers.	○	○	○	○	○	○	○	○	○
38-4) Our sales significantly decrease if Woolworths does not sell our products well.	○	○	○	○	○	○	○	○	○
38-5) Our sales significantly decrease if Woolworths does not buy our products any longer.	○	○	○	○	○	○	○	○	○
38-6) Having a good relationship with Woolworths is critical in our overall business.	○	○	○	○	○	○	○	○	○
38-7) If we do not sell our products to Woolworths, they find it difficult to substitute our products.	○	○	○	○	○	○	○	○	○
38-8) It would be difficult for Woolworths to stop working with us.	○	○	○	○	○	○	○	○	○
38-9) Woolworths do not have alternatives to our products.	○	○	○	○	○	○	○	○	○

Please provide information in the comment block if you wish to explain more about any of the items, For example, how can these items affect your level of importance?

39. Overall, how important is **Woolworths** for your firm's business?

Please explain why

40. This question examines the extent of your firm's relationship with **Woolworths**?

Please click the extent to which you agree or disagree with the following statements regarding your firm's position in **Woolworths**' supply chain.

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
40-1) It takes too much time to schedule a face-to-face meeting with Woolworths.	◯	◯	◯	◯	◯	◯	◯	◯	◯
40-2) We find it very costly to hold a face-to-face meeting with Woolworths.	◯	◯	◯	◯	◯	◯	◯	◯	◯
40-3) We do not exchange critical information about our products with Woolworths.	◯	◯	◯	◯	◯	◯	◯	◯	◯
40-4) Exchanging information about our products with Woolworths is difficult.	◯	◯	◯	◯	◯	◯	◯	◯	◯
40-5) The organisational cultures (such as values, beliefs, and assumptions) of our firm and Woolworths are different.	◯	◯	◯	◯	◯	◯	◯	◯	◯
40-6) The communication tools we use are different to Woolworths.	◯	◯	◯	◯	◯	◯	◯	◯	◯

Please provide information in the comment block if you wish to explain more about any of the items, For example, how can these items affect the extent of the relationship?

41. What factors affect your firm's position within the **Woolworths**' supply chain? Why?

42. This question examines the **relationship** between your firm and **Woolworths** in terms of **sustainability practices**.

Sustainability practices within an organisation refer to managing how the organisation's activities impact on the **community** (such as safe working conditions, legal requirements, child labour, etc) and the **environment** (such as reducing greenhouse gas emissions, focusing on waste reduction, recycling, etc).

Please click the extent to which you agree or disagree with the following statements regarding your firm's relationship with **Woolworths.**

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
42-1) Woolworths has no interest in addressing sustainability issues (such as water conservation, recycling, workforce right) of our firm's practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-2) We do not need to report our sustainability practices to Woolworths or its representatives.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-3) Our sustainability practices are valuable for Woolworths.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-4) Woolworths only asks us to meet minimum requirements of sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-5) Woolworths uses external sources such as its suppliers, or other third parties to audit or evaluate our sustainability practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-6) We have a low level of information sharing with Woolworths in terms of sustainability practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-7) Woolworths audits our sustainability practices by its own auditors.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-8) Woolworths audits our sustainability practices regularly.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-9) Woolworths is able to terminate the relationship with us in the case of non-compliance with sustainability standards (such as codes of conduct).	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-10) Woolworths urges us to follow its own sustainability standards.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-11) Woolworths imposes sustainability standards on our firm.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-12) Woolworths provides us a list of pre-approved suppliers and asks us to source our components and materials from them.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-13) Woolworths urges us to initiate sustainability practices irrespective of our constraints.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-14) Woolworths collaborates with us in setting goals regarding sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-15) There is a close cooperation between our firm and Woolworths in implementing sustainability practices.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-16) Woolworths provides education to our personnel to improve their knowledge in managing sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-17) Woolworths provides assistance to our personnel to improve their knowledge and skills in managing sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯
42-18) There are many joint activities between Woolworths and our firm to manage sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯

	Strongly agree	Agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Disagree	Strongly disagree	Not applicable	Don't know
42-19) Woolworths directly involves us in various practices related to sustainability issues.	◯	◯	◯	◯	◯	◯	◯	◯	◯

Please provide information in the comment block if you wish to explain more about any of the items, For example, how can these items affect the relationship?

43. What other types of practices does your firm and **Woolworths** perform together to manage sustainability issues within your business?

44. Aside from existing sustainability practices in your firm, what other practices do you think **Woolworths** can initiate to improve sustainability in your firm that would be beneficial for both firms? Why?

45. How does your firm's position in the business network affect the type of sustainability practices between your firm and **Woolworths**?

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9. Finalising the survey

46. You have come to the end of the survey. I will take this opportunity to thank you for your time and assistance to improve this study. Your valuable contribution is very much appreciated.

Submitting this survey implies your consent for the information you have provided to be used in this research.

To further protect your anonymity, if you would like to receive a copy of the survey result, please send an email (this will be kept confidential) to me at **hadi.rezaei@utas.edu.au**, and the result will be sent to you after the final analysis.

Do you have any further comments on issues not covered in the questionnaire or items you would like to provide more clarification?

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Appendix B: Invitation letter

My name is Hadi Rezaei Vandchali and I am a Ph.D student at the University of Tasmania. I am currently involved in a **three-year major research project** focusing on managing relationships to improve sustainability in the supply chain network for **Coles and Woolworths** as partial fulfillment of my Doctor of Philosophy degree in logistics management.

I am writing to you to request your participation in a survey. You are invited since your firm has a relationship with Coles and/or Woolworths as **an important supplier**.

Please note that this is a study for academic purpose and is not associated or sponsored by Coles or Woolworths.

This is the **first study** to analyse sustainability practices (managing environmental and social issues) in a complex network with more than **800 suppliers of Coles and Woolworths** and is conducted under the supervision of Assoc. Prof Stephen Cahoon and Dr Peggy Chen. **The purpose of this survey** is about how your firm's position in your business network can affect the type of sustainability practices, which are applied by Coles and Woolworths.

Your valuable experience, knowledge, and insights can help us to provide viable solutions about how your firm can find an **effective type of relationship** with these two large retailers to **improve the sustainability performance**.

Further information about the study is provided in the participant information sheet, which is attached.

The survey is web-based and should take around **20 minutes** to complete. Your participation in this survey is entirely voluntary and you have the right to withdraw or decline at any part of the survey. Please be assured that all of your responses will be treated as **strictly confidential**, and your identity and the name of your firm will be kept **anonymous**.

Receiving your completed questionnaire implies your consent to participate in this survey. To further protect your anonymity, if you would like to receive a copy of the survey result, please send an email (this will be kept confidential) to me at hadi.rezaei@utas.edu.au, and the result will be sent to you after the final analysis.

If you agree to participate, please click on the link below to start the survey:

Survey address (URL)
https://www.surveymonkey.com/r/LKXBWDY

If you have any question, please feel free to contact me, Mr. Hadi Rezaei Vandchali on 03 6226 2306 or via email at hadi.rezaei@utas.edu.au.

Thank you very much in advance for your support and input.

Yours sincerely,

Hadi Rezaei Vandchali

Ph.D. Student in Supply Chain and Logistics Management

University of Tasmania

Launceston Tasmania 7250

Locked Bag 1395

Appendix C: Participant Information Sheet

1. **Invitation**

You are invited to take part in a major research study investigating the effect of firms' positions in the food and grocery market on the type of sustainability practices, which are applied by Coles and Woolworths. This study is managed by Hadi Rezaei Vandchali, a Ph.D. student at the University of Tasmania under the supervision of Assoc. Prof Stephen Cahoon, Director, Sense-T at the University of Tasmania and Dr. Peggy Chen, senior lecturer at the National Centre for Ports and Shipping, Australian Maritime College. The study is being undertaken as partial fulfillment of a Doctor of Philosophy degree in logistics management.

2. **What is the purpose of this study?**

The aim of this study is to identify the appropriate types of relationship management strategies that large firms apply to their suppliers to improve the sustainability of their supply chain network (SCN).

Sustainability practices within an organisation refer to managing how the organisation's activities impact on the community (such as safe working conditions, legal requirements, child labour, etc) and the environment (such as reducing greenhouse gas emissions, focusing on waste reduction, recycling, etc).

In doing so, this study aims to analyse the structure of the SCN through suppliers' position and examines how this structure can affect large firms to identify relationship management strategies. This study also aims to identify the appropriate types of relationships to create a sustainable SCN.

3. **Why have I been invited to participate?**

You have been invited to participate in this survey because you have valuable experience, knowledge, and insights about the position of your firm and sustainability issues in your business network. In addition, since your firm has a relationship with Coles and/or Woolworths you can provide important information about your firm's

relationship with these large retailers. Thus, your participation can make a significant contribution to the purpose of this study.

4. What will I be asked to do?

You will be asked to spend around 20 minutes, at your own convenience, to complete an online survey. Most of the questions can be answered by simply ticking a box. The instructions for answering each question are explained in the questionnaire. Please note that receiving your completed questionnaire implies your consent for participating in this survey.

5. Are there any possible benefits from participation in this study?

The survey analyses the relationships between Coles and/or Woolworths and more than 800 suppliers in their supply chain network to improve sustainability. In addition, it examines those suppliers' position in their business networks. If you are interested in the findings, you are welcome to request a copy of the survey result by sending an email to the researcher's provided email address. Based on the findings, you can compare your situation with potentially 800 other suppliers both in your position in your business network and your relationship with Coles and/or Woolworths. By comparing these two perspectives, you will be able to understand, benchmark and improve your situation in these four areas:

1) Your position in your business network.

2) Your relationship with Coles and/or Woolworths in terms of sustainability issues.

3) Your relationship with firms in your own SCN which you play a role as an important firm.

4) Your sustainability performance.

6. Are there any possible risks from participation in this study?

There are no risks anticipated with participation in this study.

7. What if I change my mind during or after the study?

Your participation in this survey is entirely voluntary. There will be no consequences to you if you choose not to participate. While your participation is highly appreciated, you are free to withdraw at any time, and can do so without providing an explanation. However, since you will provide your data anonymously, it is not possible to remove your data from the survey.

8. What will happen to the information when this study is over?

All data from your participation will be stored in a secure server of University of Tasmania and password protected. Based on the research requirement, all data will be kept for five years for publication purposes and after that, it will be securely destroyed.

9. How will the results of the study be published?

The results from this study will be published in the form of a Ph.D. thesis. The findings may also be expected to be published at some conferences or other academic areas including scientific journals. A summary of the results will be provided upon request to any participant in this study.

10. What if I have questions about this study?

If you have any questions or would like to discuss more about the study, please do not hesitate to contact the following people:

Researcher:

Hadi Rezaei Vandchali

PhD candidate
University of Tasmania
Ph: 0 3 6226 2306
Email: hadi.rezaei@utas.edu.au

Research supervisor:

Associate Professor Stephen Cahoon

Director, Sense-T
University of Tasmania
Ph: 0 3 6226 2306
Email: stephen.cahoon@utas.edu.au

Research supervisor:

Dr Shu-Ling (Peggy) Chen

Senior Lecturer
University of Tasmania
Ph: 03 6324 9694
Email: pchen@utas.edu.au

Contact details for the Ethics Committee:

"This study has been approved by the Tasmanian Social Sciences Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study, please contact the Executive Officer of the HREC (Tasmania) Network on +61 3 6226 6254 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. Please quote ethics reference number [H0016795]."

Thank you for taking the time to consider this study. This information sheet is for you to keep.

Appendix D: Reminder letter

Dear…

Recently, we sent you an email requesting your assistance to fill out a survey, due to your important role in the **Coles and/or Woolworths'** supply chain network. If you have already filled out the questionnaire, many thanks for your valuable input. If not, we would really appreciate your time to complete the questionnaire via this below link.

Further information about the study is provided in the participant information sheet, which is attached.

Survey Link: https://www.surveymonkey.com/r/LKXBWDY

As mentioned in the last email, your participation will add value to this research. By participating in the survey, you will be able to understand, benchmark and improve your situation in these four areas:

1) Your position in your business network.
2) Your relationship with Coles and/or Woolworths in terms of sustainability issues.
3) Your relationship with firms in your own supply chain network in which you play a role as an important firm.
4) Your sustainability performance.

Please let us know if you have any questions on 03 6226 2306 or via email at hadi.rezaei@utas.edu.au. We will be glad to answer them.

Thanks in advance for your cooperation.

Kind Regards,

Appendix E: Correlation matrix for RMS

	N1	N2	N3	T1	T2	T3	D1	D2	D3	D4	D5	D6	D7
N1	1.000	0.711	0.505	0.256	-0.172	0.325	-0.213	-0.248	-0.283	-0.341	-0.307	-0.097	-0.253
N2	0.711	1.000	0.488	0.346	-0.049	0.373	-0.231	-0.244	-0.216	-0.462	-0.240	-0.097	-0.151
N3	0.505	0.488	1.000	0.135	-0.299	0.210	-0.196	-0.294	-0.214	-0.330	-0.244	-0.158	-0.305
T1	0.256	0.346	0.135	1.000	0.269	0.517	0.064	0.185	-0.029	0.045	0.063	0.044	-0.047
T2	-0.172	-0.049	-0.299	0.269	1.000	0.345	0.353	0.283	0.344	0.408	0.247	0.290	0.202
T3	0.325	0.373	0.210	0.517	0.345	1.000	-0.017	-0.016	-0.028	-0.073	-0.118	0.105	-0.175
D1	-0.213	-0.231	-0.196	0.064	0.353	-0.017	1.000	0.685	0.639	0.745	0.659	0.260	0.586
D2	-0.248	-0.244	-0.294	0.185	0.283	-0.016	0.685	1.000	0.656	0.716	0.778	0.383	0.653
D3	-0.283	-0.216	-0.214	-0.029	0.344	-0.028	0.639	0.656	1.000	0.581	0.617	0.294	0.581
D4	-0.341	-0.462	-0.330	0.045	0.408	-0.073	0.745	0.716	0.581	1.000	0.758	0.294	0.625
D5	-0.307	-0.240	-0.244	0.063	0.247	-0.118	0.659	0.778	0.617	0.758	1.000	0.225	0.755
D6	-0.097	-0.097	-0.158	0.044	0.290	0.105	0.260	0.383	0.294	0.294	0.225	1.000	0.302
D7	-0.253	-0.151	-0.305	-0.047	0.202	-0.175	0.586	0.653	0.581	0.625	0.755	0.302	1.000
C1	-0.457	-0.416	-0.320	-0.230	0.046	-0.372	0.365	0.447	0.327	0.345	0.375	0.265	0.382
C2	-0.348	-0.409	-0.233	-0.272	-0.020	-0.291	0.350	0.337	0.260	0.323	0.346	0.295	0.338
C3	-0.131	-0.220	-0.062	-0.191	0.040	-0.174	0.377	0.418	0.427	0.373	0.399	0.167	0.386
C4	-0.331	-0.294	-0.273	-0.119	0.198	-0.181	0.464	0.516	0.459	0.479	0.499	0.248	0.395
C5	-0.380	-0.337	-0.327	-0.151	0.008	-0.351	0.347	0.434	0.332	0.293	0.394	0.212	0.299
C6	-0.210	-0.315	-0.093	-0.151	-0.011	-0.184	0.359	0.405	0.304	0.330	0.316	0.246	0.260

Appendix F: Correlation matrix for the SCN structure

	T1	T2	T3	T4	T5	EP6	EP7	RefP8	RefP9	LP10	LP11	RewP12	RewP13	CP14	CP15	SD16	SD17	SD18	SD19	SD20	SD2
T1	1.000	0.559	0.453	0.528	0.179	0.241	0.188	0.204	0.156	0.438	0.262	0.190	0.140	0.267	-0.013	-0.045	-0.229	-0.166	0.026	-0.088	-0.2
T2	0.559	1.000	0.531	0.622	0.049	0.112	0.121	0.206	0.036	0.467	0.424	0.076	0.091	0.279	-0.055	-0.018	-0.182	-0.143	0.062	-0.066	-0.1
T3	0.453	0.531	1.000	0.648	0.260	0.353	0.205	0.255	0.304	0.486	0.557	0.192	0.276	0.008	0.317	0.050	-0.136	-0.075	0.004	-0.106	-0.2
T4	0.528	0.622	0.648	1.000	0.395	0.078	0.067	0.269	0.233	0.361	0.388	0.165	0.201	-0.149	-0.038	-0.002	-0.198	-0.067	-0.035	-0.113	-0.2
T5	0.179	0.049	0.260	0.395	1.000	0.039	0.391	0.247	0.303	0.056	-0.043	0.252	0.006	-0.133	-0.012	0.189	0.046	0.170	0.159	0.179	0.0
EP6	0.241	0.112	0.353	0.078	0.039	1.000	0.503	0.403	0.297	0.220	0.090	0.362	0.352	0.270	0.277	-0.331	-0.287	-0.314	-0.350	-0.342	-0.2
EP7	0.188	0.121	0.205	0.067	0.391	0.503	1.000	0.573	0.610	0.418	0.106	0.227	0.208	0.154	0.112	-0.206	-0.033	-0.021	-0.056	-0.050	-0.0
RefP8	0.204	0.206	0.255	0.269	0.247	0.403	0.573	1.000	0.626	0.441	0.221	0.066	0.096	0.183	0.102	-0.075	-0.061	-0.027	-0.063	-0.105	-0.0
RefP9	0.156	0.036	0.304	0.233	0.303	0.297	0.610	0.626	1.000	0.390	0.219	0.077	0.102	0.063	0.009	-0.099	0.025	0.020	-0.040	0.053	0.1
LP10	0.438	0.467	0.486	0.361	0.056	0.220	0.418	0.441	0.390	1.000	0.609	0.110	0.110	0.152	0.054	-0.127	-0.050	-0.106	0.009	-0.079	-0.2
LP11	0.262	0.424	0.557	0.388	-0.043	0.090	0.106	0.221	0.219	0.609	1.000	0.103	0.060	0.119	0.137	-0.037	-0.045	-0.044	0.034	-0.104	-0.1
RewP12	0.190	0.076	0.192	0.165	0.252	0.362	0.227	0.066	0.077	0.110	0.103	1.000	0.582	0.162	0.211	-0.135	-0.035	-0.053	0.058	-0.008	-0.1
RewP13	0.140	0.091	0.276	0.201	0.006	0.352	0.208	0.096	0.102	0.110	0.060	0.582	1.000	0.312	0.471	-0.079	-0.100	-0.213	-0.061	-0.067	-0.2
CP14	0.267	0.279	0.008	-0.149	-0.133	0.270	0.154	0.183	0.063	0.152	0.119	0.162	0.312	1.000	0.315	0.116	0.042	0.001	0.024	0.018	0.1
CP15	-0.013	-0.055	0.317	-0.038	-0.012	0.277	0.112	0.102	0.009	0.054	0.137	0.211	0.471	0.315	1.000	0.288	0.171	0.116	0.140	0.120	-0.0
SD16	-0.045	-0.018	0.050	-0.002	0.189	-0.331	-0.206	-0.075	-0.099	-0.127	-0.037	-0.135	-0.079	0.116	0.288	1.000	0.654	0.619	0.701	0.701	0.5
SD17	-0.229	-0.182	-0.136	-0.198	0.046	-0.287	-0.033	-0.061	0.025	-0.050	-0.045	-0.035	-0.100	0.042	0.171	0.654	1.000	0.833	0.738	0.820	0.6
SD18	-0.166	-0.143	-0.075	-0.067	0.170	-0.314	-0.021	-0.027	0.020	-0.106	-0.044	-0.053	-0.213	0.001	0.116	0.619	0.833	1.000	0.695	0.775	0.5
SD19	0.026	0.062	0.004	-0.035	0.159	-0.350	-0.056	-0.063	-0.040	0.009	0.034	0.058	-0.061	0.024	0.140	0.701	0.738	0.695	1.000	0.892	0.6
SD20	-0.088	-0.066	-0.106	-0.113	0.179	-0.342	-0.050	-0.105	0.053	-0.079	-0.104	-0.008	-0.067	0.018	0.120	0.701	0.820	0.775	0.892	1.000	0.7
SD21	-0.214	-0.194	-0.278	-0.293	0.018	-0.255	-0.055	-0.048	0.137	-0.219	-0.161	-0.107	-0.203	0.117	-0.004	0.590	0.666	0.557	0.651	0.729	1.0
FD22	-0.135	-0.197	-0.326	-0.363	0.141	-0.061	0.115	0.047	-0.166	-0.330	-0.178	0.097	0.057	0.342	0.160	0.315	0.332	0.264	0.312	0.358	0.3
FD23	0.008	-0.063	0.029	0.028	0.365	0.180	0.281	0.296	-0.055	-0.024	0.011	0.246	0.155	0.216	0.301	0.265	0.225	0.207	0.220	0.224	0.1
FD24	-0.114	-0.231	-0.242	-0.221	0.167	0.071	0.096	0.096	-0.189	-0.186	-0.020	0.252	0.128	0.189	0.199	0.231	0.199	0.130	0.171	0.152	0.1
PD25	-0.184	0.059	0.049	0.114	-0.066	-0.140	-0.258	-0.133	-0.066	0.040	0.211	-0.165	-0.171	-0.107	-0.017	-0.031	-0.056	0.058	-0.046	-0.080	-0.1
PD26	-0.008	0.312	0.152	0.238	-0.037	-0.079	-0.108	-0.110	0.012	0.142	0.198	-0.154	-0.116	-0.010	-0.136	0.025	-0.172	-0.089	-0.039	-0.087	-0.1
OD27	0.021	0.156	-0.197	-0.012	-0.292	0.018	-0.035	0.010	-0.238	-0.009	-0.008	0.092	0.137	0.134	-0.010	-0.185	-0.221	-0.232	-0.180	-0.238	-0.2
OD28	-0.139	0.108	-0.126	0.126	-0.205	-0.107	-0.169	-0.038	-0.223	-0.062	0.016	0.044	0.149	-0.057	-0.090	-0.176	-0.284	-0.300	-0.194	-0.263	-0.2
CD29	-0.148	-0.040	-0.258	-0.066	-0.095	-0.263	-0.208	0.059	-0.239	-0.079	-0.072	-0.138	-0.060	0.113	-0.024	-0.053	-0.225	-0.146	-0.263	-0.248	-0.2
CD30	-0.073	0.043	-0.003	-0.083	-0.077	0.152	0.005	0.141	-0.069	-0.025	0.140	-0.003	-0.096	0.139	-0.064	-0.282	-0.437	-0.358	-0.413	-0.503	-0.3

Appendix G: Coefficients of variables for non-compliance RMS

Model		Unstandardized coefficients		Standardized coefficients	T-test	Sig.
		B	Std. Error	beta		
2	(Constant)	3.751	1.652	-	2.271	0.027
	Transparency	-0.157	0.174	-0.114	-0.900	0.372
	'RE' power	-0.322	0.223	-0.180	-1.442	0.155
	'RC' power	-0.001	0.153	-0.001	-0.009	0.992
	Supplier dependency	-0.116	0.134	-0.109	-0.862	0.392
	Buyer dependency	0.147	0.119	0.153	1.233	0.223
	Distance	0.550	0.144	0.445	3.810	0.000
	Length of relationship	0.069	0.130	0.064	0.527	0.600
3	(Constant)	3.995	1.728	-	2.311	0.024
	Transparency	-0.153	0.176	-0.111	-0.870	0.388
	'RE' power	-0.329	0.225	-0.184	-1.463	0.149
	'RC' power	-0.010	0.155	-0.007	-0.062	0.951
	Supplier dependency	-0.118	0.135	-0.111	-0.872	0.387
	Buyer dependency	0.153	0.120	0.160	1.269	0.210
	Distance	0.556	0.146	0.450	3.817	0.000
	Length of relationship	0.075	0.132	0.070	0.567	0.573
	Number of employees	-0.057	0.111	-0.058	-0.516	0.608
4	(Constant)	4.106	1.784	-	2.301	0.025
	Transparency	-0.165	0.182	-0.119	-0.906	0.368
	'RE' power	-0.329	0.227	-0.184	-1.452	0.152
	'RC' power	-0.003	0.158	-0.002	-0.017	0.987
	Supplier dependency	-0.113	0.137	-0.106	-0.823	0.414
	Buyer dependency	0.150	0.121	0.157	1.239	0.221
	Distance	0.569	0.153	0.460	3.713	0.000
	Length of relationship	0.094	0.149	0.088	0.632	0.530
	Number of employees	-0.051	0.114	-0.051	-0.448	0.656
	Supplier's age	-0.051	0.179	-0.040	-0.287	0.775
5	(Constant)	3.518	1.753	-	2.007	0.050
	Transparency	-0.076	0.181	-0.055	-0.421	0.675
	'RE' power	-0.340	0.220	-0.190	-1.545	0.128
	'RC' power	-0.025	0.153	-0.020	-0.165	0.870
	Supplier dependency	-0.157	0.135	-0.148	-1.166	0.249
	Buyer dependency	0.104	0.120	0.109	0.866	0.390
	Distance	0.471	0.156	0.381	3.024	0.004
	Length of relationship	-0.026	0.155	-0.025	-0.170	0.866
	Number of employees	-0.122	0.115	-0.123	-1.061	0.293
	Supplier's age	-0.075	0.174	-0.059	-0.432	0.667
	Financial turnover	0.543	0.255	0.311	2.133	0.037

Appendix H: Coefficients of variables for transactional RMS

Model		Unstandardized coefficients		Standardized coefficients	T-test	Sig.
		B	Std. Error	beta		
2	(Constant)	1.717	1.348	-	1.273	0.208
	Transparency	0.285	0.142	0.237	2.004	0.050
	'RE' power	-0.256	0.182	-0.164	-1.404	0.166
	'RC' power	0.065	0.125	0.058	0.525	0.601
	Supplier dependency	0.245	0.110	0.265	2.233	0.029
	Buyer dependency	-0.235	0.097	-0.282	-2.418	0.019
	Distance	0.495	0.118	0.460	4.201	0.000
	Length of relationship	0.050	0.106	0.053	0.466	0.643
3	(Constant)	2.382	1.378	-	1.729	0.089
	Transparency	0.296	0.140	0.246	2.115	0.039
	'RE' power	-0.276	0.179	-0.178	-1.540	0.129
	'RC' power	0.043	0.123	0.038	0.351	0.727
	Supplier dependency	0.239	0.108	0.259	2.218	0.030
	Buyer dependency	-0.218	0.096	-0.263	-2.279	0.026
	Distance	0.513	0.116	0.477	4.414	0.000
	Length of relationship	0.066	0.105	0.071	0.628	0.533
	Number of employees	-0.156	0.088	-0.181	-1.764	0.083
4	(Constant)	2.295	1.422	-	1.614	0.112
	Transparency	0.305	0.145	0.254	2.107	0.040
	'RE' power	-0.276	0.181	-0.178	-1.528	0.132
	'RC' power	0.038	0.126	0.034	0.300	0.765
	Supplier dependency	0.235	0.109	0.255	2.148	0.036
	Buyer dependency	-0.217	0.097	-0.261	-2.239	0.029
	Distance	0.503	0.122	0.468	4.119	0.000
	Length of relationship	0.051	0.118	0.054	0.427	0.671
	Number of employees	-0.161	0.091	-0.186	-1.772	0.082
	Supplier's age	0.041	0.143	0.036	0.285	0.777
5	(Constant)	2.310	1.453	-	1.590	0.118
	Transparency	0.303	0.150	0.252	2.018	0.048
	'RE' power	-0.276	0.183	-0.178	-1.513	0.136
	'RC' power	0.038	0.127	0.034	0.301	0.764
	Supplier dependency	0.236	0.112	0.256	2.114	0.039
	Buyer dependency	-0.215	0.099	-0.259	-2.170	0.034
	Distance	0.506	0.129	0.470	3.919	0.000
	Length of relationship	0.054	0.128	0.058	0.418	0.677
	Number of employees	-0.159	0.096	-0.184	-1.662	0.102
	Supplier's age	0.041	0.144	0.037	0.286	0.776
	Financial turnover	-0.014	0.211	-0.009	-0.065	0.948

Appendix I: Coefficients of variables for dictatorial RMS

Model		Unstandardized coefficients		Standardized coefficients	T-test	Sig.
		B	Std. Error	beta		
2	(Constant)	2.070	1.849	-	1.119	0.268
	Transparency	0.522	0.195	0.362	2.675	0.010
	'RE' power	-0.356	0.250	-0.191	-1.425	0.160
	'RC' power	-0.139	0.171	-0.103	-0.815	0.419
	Supplier dependency	0.314	0.150	0.284	2.091	0.041
	Buyer dependency	0.118	0.133	0.118	0.886	0.379
	Distance	0.002	0.162	0.002	0.015	0.988
	Length of relationship	-0.045	0.146	-0.040	-0.309	0.759
3	(Constant)	2.586	1.923	-	1.345	0.184
	Transparency	0.530	0.195	0.368	2.715	0.009
	'RE' power	-0.372	0.250	-0.199	-1.485	0.143
	'RC' power	-0.157	0.172	-0.116	-0.911	0.366
	Supplier dependency	0.310	0.150	0.280	2.060	0.044
	Buyer dependency	0.131	0.134	0.131	0.976	0.333
	Distance	0.016	0.162	0.013	0.102	0.919
	Length of relationship	-0.032	0.146	-0.029	-0.221	0.826
	Number of employees	-0.121	0.123	-0.117	-0.981	0.331
4	(Constant)	2.474	1.986	-	1.246	0.218
	Transparency	0.543	0.202	0.377	2.681	0.010
	'RE' power	-0.372	0.253	-0.199	-1.473	0.146
	'RC' power	-0.164	0.175	-0.121	-0.933	0.355
	Supplier dependency	0.305	0.153	0.276	1.995	0.051
	Buyer dependency	0.133	0.135	0.133	0.983	0.330
	Distance	0.004	0.171	0.003	0.023	0.982
	Length of relationship	-0.052	0.165	-0.046	-0.314	0.755
	Number of employees	-0.127	0.127	-0.123	-1.005	0.319
	Supplier's age	0.052	0.199	0.039	0.261	0.795
5	(Constant)	2.533	2.028	-	1.249	0.217
	Transparency	0.534	0.210	0.371	2.545	0.014
	'RE' power	-0.371	0.255	-0.199	-1.456	0.151
	'RC' power	-0.161	0.177	-0.120	-0.910	0.367
	Supplier dependency	0.309	0.156	0.280	1.983	0.052
	Buyer dependency	0.137	0.139	0.138	0.991	0.326
	Distance	0.014	0.180	0.011	0.076	0.940
	Length of relationship	-0.040	0.179	-0.036	-0.222	0.825
	Number of employees	-0.120	0.133	-0.116	-0.900	0.372
	Supplier's age	0.054	0.201	0.041	0.270	0.788
	Financial turnover	-0.054	0.294	-0.030	-0.185	0.854

Appendix J: Coefficients of variables for collaborative RMS

Model		Unstandardized coefficients		Standardized coefficients	T-test	Sig.
		B	Std. Error	beta		
2	(Constant)	-0.245	1.576	-	-0.156	0.877
	Transparency	0.518	0.166	0.383	3.117	0.003
	'RE' power	0.307	0.213	0.175	1.440	0.155
	'RC' power	-0.090	0.146	-0.071	-0.615	0.541
	Supplier dependency	0.096	0.128	0.092	0.751	0.456
	Buyer dependency	0.186	0.113	0.199	1.643	0.106
	Distance	-0.306	0.138	-0.252	-2.223	0.030
	Length of relationship	-0.239	0.124	-0.227	-1.921	0.060
3	(Constant)	-1.535	1.532	-	-1.001	0.321
	Transparency	0.497	0.156	0.367	3.194	0.002
	'RE' power	0.346	0.200	0.198	1.736	0.088
	'RC' power	-0.046	0.137	-0.037	-0.339	0.736
	Supplier dependency	0.107	0.120	0.103	0.895	0.375
	Buyer dependency	0.155	0.107	0.165	1.452	0.152
	Distance	-0.341	0.129	-0.281	-2.638	0.011
	Length of relationship	-0.270	0.117	-0.257	-2.316	0.024
	Number of employees	0.302	0.098	0.310	3.072	0.003
4	(Constant)	-1.232	1.572	-	-0.784	0.436
	Transparency	0.464	0.160	0.343	2.895	0.005
	'RE' power	0.346	0.200	0.198	1.732	0.089
	'RC' power	-0.027	0.139	-0.022	-0.197	0.844
	Supplier dependency	0.121	0.121	0.116	0.997	0.323
	Buyer dependency	0.149	0.107	0.159	1.392	0.169
	Distance	-0.307	0.135	-0.253	-2.273	0.027
	Length of relationship	-0.217	0.131	-0.207	-1.660	0.102
	Number of employees	0.319	0.100	0.328	3.180	0.002
	Supplier's age	-0.141	0.158	-0.112	-0.891	0.377
5	(Constant)	-1.519	1.588	-	-0.957	0.343
	Transparency	0.507	0.164	0.374	3.089	0.003
	'RE' power	0.341	0.199	0.195	1.711	0.093
	'RC' power	-0.038	0.139	-0.030	-0.277	0.783
	Supplier dependency	0.099	0.122	0.095	0.812	0.420
	Buyer dependency	0.126	0.108	0.135	1.162	0.250
	Distance	-0.355	0.141	-0.293	-2.517	0.015
	Length of relationship	-0.276	0.140	-0.262	-1.968	0.054
	Number of employees	0.284	0.104	0.292	2.719	0.009
	Supplier's age	-0.152	0.158	-0.121	-0.965	0.339
	Financial turnover	0.265	0.231	0.154	1.148	0.256

Appendix K: Journal paper

Creating a sustainable supply chain network by adopting relationship management strategies

Abstract

Purpose: This paper develops a conceptual framework to analyse the impact of a supply chain network (SCN) structure on relationship management strategies (RMS) that focal firms apply to manage sustainability issues within the SCN.

Design/methodology/approach: This paper is based on a comprehensive review and analysis of the industrial marketing and purchasing (IMP), sustainable supply chain management (SSCM), and SCN literature.

Findings: The conceptual framework expands the network perspective in the SSCM context by considering the important role of the SCN structure in the firm's decision-making process. Four factors (dependency, distance, power, and transparency) were found that are useful in conceptualising the SCN structure. The conceptual framework also categorises various sustainability practices into four RMS (non-compliance, transactional, dictatorial, and collaborative), which are needed to make a SCN more sustainable. In addition, 16 propositions are developed based on how firms may identify the most effective RMS to implement appropriate sustainability practices through examining their SCN structure.

Research limitations/implications: The conceptual framework, developed as a result of a comprehensive review of the literature, led to the development of 16 propositions, which can assist in furthering a research agenda on RMS to diffuse various sustainability practices within SCN structures.

Originality/value: The relationship between SCN structure and RMS in the sustainability context remains an under-researched but emerging area of interest. This paper leverages existing research to develop a conceptual framework suitable for empirical testing.

Keywords: Supply chain network structure, sustainable supply chain management, relationship management strategies, industrial marketing relationships, sustainability practices

Introduction

In recent years, incorporating sustainable development objectives into the supply chain management (SCM) context has become an important topic among numerous researchers (Beske-Janssen, Johnson and Schaltegger 2015; Dubey, Gunasekaran and Papadopoulos 2017). The driving force for the interest is the mounting pressure from various stakeholders such as government regulators, community activists, and customers who expect more commitment to sustainability issues from firms (Abbasi 2017). The reason for this pressure is may related to the difficulties for end-customers to distinguish between the sustainability standards of the focal firms and their supply chain players (Roberts, 2003). In this regard, many firms have been redesigning their processes in terms of sustainable development objectives and employing various sustainability practices to enhance their brand and increase their competitive advantage (Dubey, Gunasekaran and Papadopoulos 2017; Kotler 2011; Mariadoss, Tansuhaj and Mouri 2011; Sharma et al. 2010).

Since demand and supply interactions do not only occur between two isolated parties (Rowley 1997), it is more realistic to look at supply chains (SC) from a network perspective. This recognises that the relationships between actors across the SC are not linear, rather, they can be understood as a web of direct and indirect relationships between various actors in a supply chain network (SCN) (Miemczyk, Johnsen and Macquet 2012). This development is inspired by the work of the industrial marketing and purchasing (IMP) group (Ford and McDowell 1999; Håkansson and Snehota 1995; Mattsson 1997; Ritter, Wilkinson and Johnston 2004). The industrial marketing relationship considers all activities that establish, develop, and maintain successful relational exchanges (Chu, Chang and Huang 2011), and has been extended via marketing research to a whole set of stakeholders rather than focusing only on the consumer in the business network (Svensson et al. 2016). Sharma et al. 2010 argue that some firms have been mainly focused on targeting the environmentally-conscious consumers while others concentrated on their marketing role in the SCM context. Marketing scholars also identify that “individual relationships are embedded in a context of other relationships that could have governance implications” (Heide 1994,

81). This means the network's structure can be shaped by the actions of numerous network actors (Kilduff and Tsai 2003; Heide 1994; Wuyts and Van den Bulte 2012). For example, governance can be defined as the explicit and implicit exchange rules in the relationship between two economic parties (Ghosh and John 2005), and can be varied from strong relations (e.g., joint venture) to weak relations (e.g., marketing alliances) (Hannah and Griffith 2012). Furthermore, managing sustainability issues within the SCM context includes a set of standards and practices that use the SC as a channel to influence the social and environmental status of the manufacturing and consumption process. The network perspective, therefore, provides information to better understand the sustainable development concept beyond a firm's boundaries (Kaneberg, Hertz and Jensen 2016; Miemczyk, Johnsen and Macquet 2012; Touboulic and Walker 2015), and has been considered as a high interest area by numerous researchers (Frostenson and Prenkert 2015; Meinlschmidt, Schleper and Foerstl 2018; Roscoe, Cousins and Lamming 2016; Wilhelm et al. 2016b).

In response to the increasing pressure, a growing number of large firms have attempted to employ various sustainability practices within their SCN (Dubey et al. 2017; Wilhelm et al. 2016a). Due to the vast resources these firms have, researchers often refer to them as focal firms in the business sustainability which may be necessary to institutionalise the sustainability agenda in the SCN (Glover et al. 2014). However, finding appropriate types of sustainability practices, which relate to different types of business relationships, is a challenging task (Grimm, Hofstetter and Sarkis 2016; Meinlschmidt, Schleper and Foerstl 2018). Typically, focal firms are embedded in an extended network environment, which consists of various SCN actors (such as suppliers, manufacturers, customers) who are often interrelated. The power balance, for example, between suppliers and retailers can affect the quality of the relationships between them (Mysen, Svensson and Högevold 2012), which can affect the types of sustainability practices in the SSCM context (Tachizawa and Wong 2014). Accordingly, the position of the actors and the pattern of interactions among them within the SCN structure can affect the implementation of the sustainability practices

chosen by the focal firms (Touboulic and Walker 2015; Meinlschmidt, Schleper and Foerstl 2018).

Many studies have identified the significant impact of the SCN structure on a firm's strategic actions with respect to incorporating sustainability practices into its SCN (Frostenson and Prenkert 2015; Meinlschmidt, Schleper and Foerstl 2018; Miemczyk, Johnsen and Macquet 2012; Roscoe, Cousins and Lamming 2016; Tachizawa and Wong 2014; Wilhelm et al. 2016b). However, there is still a strong need to explore different aspects of SCN structure within the SSCM context (Meinlschmidt, Schleper and Foerstl 2018; Wilhelm et al. 2016b). Therefore, regarding the impact of the SCN structure on the adoption of sustainability practices and consequently the types of relationships chosen by the focal firms to manage sustainability issues, the next section explains how SCN theory provides a holistic view within a SCM context. Then, by providing the network perspective, the subsequent section describes how focal firms can improve sustainability in their SCN. This is followed by an explanation of how a SCN structure affects the decision process in focal firms with respect to managing sustainability issue within their SCN. Next, a conceptual framework is developed to assist focal firms to decide which types of RMS are appropriate to implement sustainability practices and is followed by suggesting propositions. In the last section, managerial implications, limitations and suggestions for future research are discussed.

Supply chain network theory

Networks are a "living, ever-changing organism" (Ritter, Wilkinson and Johnston 2004, 180) and a firm's ability to manage networks can affect its performance and development (Ritter and Gemünden 2003). At the network level, analysing the SCM practices goes beyond the organisation's boundaries, as the advancement of the internet tools and their integration with business communication (Lichtenthal and Eliaz 2003) facilitate the implementation of business buyer relationship management (Lichtenthal 2004). Network level analysis, stemming from network theory (which considers the whole of network perspective (Provan, Fish and Sydow 2007; Tracey, Heide and Bell 2014)), has been applied in the stakeholder literature to consider the multiple numbers of stakeholders, including suppliers, competitors, customers, non-

governmental organisations (NGO) and government bodies, and their relationships with each other (Miemczyk, Johnsen and Macquet 2012). Investigation of interrelationships between various actors within a network and analysis of their behaviours based on positional power are not typically considered by the dyadic and linear level of analysis (Miemczyk, Johnsen and Macquet 2012). Dyads are concerned with relationships between only two parties, and a focal dyad is related to any exchange relationship between two parties which is under investigation (Achrol, Reve, and Stern 1983). This type of relationship considers a focal firm as being the centre of its stakeholders and analyses the influences that various stakeholders (such as suppliers and customers) exert on the firm in a dyadic interaction (Miemczyk, Johnsen and Macquet 2012). The linear level includes the type of relationship that a firm indirectly develops through another firm, such as the indirect relationships between a firm and its second or more tier customers/suppliers (Anderson, Håkansson and Johanson 1994). The relationship at the connected-relations level has been analysed by Braziotis et al. (2013) as being multiple customer-supplier relationships, starting from extracting raw material to delivering final goods. From the connected relations' perspective, the structure of the flows in the SCM context is realised as a linear system in which managers usually focus on managing goods and materials that are vertically delivered between various organisations (Zuo, Kajikawa and Mori 2016). However, from a network perspective, the firms tend to pay attention to the various stakeholders within the SCM context rather than the firms who are directly active in the process of producing a product (Roome 2001) as the firms are dependent upon their network (Griffith and Harvey 2004). The network perspective is a vital component to fully understand the nature of dyadic relationships (Wathne and Heide 2004). For example, buying firms can create a buying group or a buying consortium (e.g., ProGroup in hardware industry), which can be considered a major force for other actors in the SCN (Geyskens, Gielens and Wuyts 2015). Wuyts and Dutta (2014) refer to this perspective as alliance portfolios that can have various consequences in the market (e.g., effects on superior product innovation). This is important, as there is a growing awareness in the business environment emphasising the importance of having effective and efficient network relationships within various business practices (e.g., new product

development (NPD) in marketing practices (Achrol and Kotler 1999; Tracey, Heide and Bell 2014; Wuyts and Van den Bulte 2012)) which can lead to a competitive advantage (Addo-Tenkorang et al. 2017).

Incorporating the term, "network" into the SCM context indicates an attempt to provide a wider and more strategic view by utilising various potential resources of network actors in a more effective manner (Jin and Edmunds 2015). The network perspective questions the notion of applying the linear and one-dimensional approach to the SC by arguing the issues of relational aspects from a distinctive fixed position in the SC (Frostenson and Prenkert 2015). It also reflects the pattern of focal firms' relationships with their partners' partners and also third parties within the business network context (Wuyts and Geyskens 2005). In addition, there is a growing awareness within industrial marketing relationships to analyse the markets from an inter-organisational view rather than a discrete one (Homburg and Kuester 2001). For example, marketing decisions can be challenging in technology-intensive markets (John, Weiss, and Dutta 1999). Firms can facilitate the accessibility to the state of the art technologies and also market their new products by creating alliance networks within the high technology industries (Wuyts, Dutta, and Stremersch 2004). Understanding these new technologies and applying them to RMS is essential, particularly in choosing the different international market entry (IME) strategies. Further discussion about the different taxonomy of IME strategies, can be found in the extensive literature conducted by Watson et al. (2018). The relational viewpoint emanates from the notion that resources are distributed to the various entities within the business context. To create value for the customers, firms need to interact with other firms to have access to various resources which are out of their immediate control (Frostenson and Prenkert 2015). Therefore, understanding the firms' position and their relationship with various actors in the network perspective is a crucial step in developing appropriate types of strategic decisions (Cheng and Holmen 2015; Srinivasan, Wuyts and Mallapragada 2018).

Sustainability issues in the supply chain network

Based on the various definitions of sustainable supply chain management (SSCM), it seems essential that the unit of analysis in the SSCM needs to be analysed through an inter-organisational network, which includes various types of actors at the macro-environmental level (Matthews et al. 2016). This is important as the sustainability issues in the extended network have a significant impact on a firm's business performance (Shokri Kahi et al. 2017). By looking at the SSCM from the network perspective, a sustainable supply chain network (SSCN) can be defined as a set of actors who work together to create a "sustainable circular economy" through considering the potential for social and environmental issues across the various stages of the product life cycle (Winkler 2011, 244). Firms typically consider the broad network of actors when attempting to ensure that stakeholders' expectations about sustainable development objectives are met (Ferro et al. 2017). The benefit of adopting this perspective is that some actors are able to compensate for others in the network, thus enabling the firm to meet its sustainable development objectives (Miemczyk, Johnsen and Macquet 2012). This means that the achievement of sustainability can occur through involving multiple interconnected actors who may themselves have different objectives (Araujo and Harrison 2002).

A SSCN can be considered a cornerstone of firms' sustainable development strategies, and developing such a sustainable network needs firms to evaluate their SCN actors with the improvement of social and environmental aspects (Snabe 2009). However, achieving sustainable development objectives in the SCN needs a key actor, which has sufficient resources to play a lead role (Alvarez, Pilbeam and Wilding 2010). This is mainly because they have more capabilities to systematically pursue the sustainability issues in the extended network (Elg and Hultman 2011). In most cases, the focal firm refers to the core actor who is driving sustainability in the SCM context (Beske-Janssen, Johnson and Schaltegger 2015). In the SSCM context, Seuring and Müller (2008, 1699) defined focal firms as "those firms that usually (1) rule or govern the supply chain, (2) provide the direct contact to the customer, and (3) design the product or service offered". In pursuing sustainable development objectives, focal firms have

realised that managing sustainability issues in this context, which includes only their immediate SCN actors may not be effective (Tachizawa and Wong 2014). End customers are more likely to attribute the accountability of the sustainability issues to the focal firms, even though they may not have sufficient influence over their SCN actors (Hartmann and Moeller 2014). Therefore, focal firms seem to be the appropriate starting point to follow up on sustainability issues in their SCN (Beske-Janssen, Johnson and Schaltegger 2015).

The task of applying the particular types of relationships,which includes specific types of sustainability practices, is quite challenging as all RMS are not equally effective (Zhang et al. 2016). This is also important as the wrong type of relationships can be a source of tension between firms (Prince et al. 2016). Sustainability practices in firms cannot be developed in isolation, but instead, the various actors‘ characteristics (both upstream and downstream in the SC) (Awaysheh and Klassen 2010) and the interactions among multiple stakeholders (Parmigiani, Klassen and Russo 2011) need to be considered in the development of sustainability practices. As a firm’s behaviour is highly dependent on the structure of interactions it has with the other actors in the network (Ritter, Wilkinson and Johnston 2004), it suggests it may be beneficial to analyse the SCN structure and determine how it can affect the firm’s behaviour and strategy to manage sustainability practices.

The impact of supply chain network structure on relationship management strategies to manage sustainability issues

As the SCN environment is complex, it is not easy for the focal firm to take strategic actions to achieve competitiveness unless it analyses the SCN in the way in which the SCN operates (Ekanayake, Childerhouse and Sun 2017). As Snehota and Hakansson (1995, 18) stated over two decades ago, “as managerial action is guided by how situations are framed, the relationship perspective and the network approach are unquestionably of consequence to management”. A SCN consists of interrelated firms that are involved in various activities from extracting the raw materials to delivering the final product to the end-customer (Harland et al. 2001). It is then essential to analyse the influences the various SCN actors have on the focal firm’s processes of

determining a governance mechanism to be incorporated into the different types of relationships (Pullman et al. 2017), which can ultimatly lead to the sustainability practices. However, a range of research has considered governance mechanisms in the context of dyadic relationships which needs to be promoted to a wider context as there are different patterns of multiple relationships within the marketing exchange (Hutt, Reingen, and Ronchetto 1988; Kumar, Heide, and Wathne 2011; Palmatier, Scheer, and Steenkamp 2007). Wathne and Heide (2004, 73) for example, point out that a firm's governance response in a dyadic relationship is highly affected by its "immediate network context". Furthermore, the focal firms' expectation of achieving a specific outcome in sustainability performance is mainly related to the types of relationships with the various actors in the SCN (Roscoe, Cousins and Lamming 2016). For example, Roscoe, Cousins and Lamming (2016) argue that to develop eco-innovations (that is, innovation that improves environmental performances) that lead to improving the sustainability performance in the SCN, the focal firms need various types of relationships, including the building of weak relationships with multiple small actors and other actors that bridge 'structural holes' and build strong relationships with the strategic actors in the network. On the basis of a review of SSCM studies, Seuring (2011) identifies that focal firms usually engage with their suppliers to help them improve their business processes by providing a win-win situation with respect to sustainability issues. This closeness can also increase the effectiveness of relationships by, for example, controlling opportunism within the relationships (Wathne and Heide 2000; Wuyts and Geyskens 2005) which in turn may result in a loss of future contracts for the opportunistic actors (Houston and Johnson 2000). However, it is not clear how focal firms identify which actors in their SCN are strategic and which actors, for example, bridge the structural hole based on the pattern of interactions among the various SCN actors. Similarly, Wuyts and Van den Bulte (2012) argue that there is a gap in the marketing literature in terms of analysing the network governance effects and identifying the impact of network structure on the firms' behaviour. This is also important because, for example, the marketing literature has a tendency to only focus on the end-consumer, however, instead, it should be extended to the whole set of stakeholders in the business network context (Svensson et al. 2016). Thus, it is of

interest to examine the network structure of SC interactions (Addo-Tenkorang et al. 2017).

Over the last decade there still appears to be little guidance for focal firms on the various types of network governance mechanisms and the factors that can affect these mechanisms in the literature (Van den bulte 2010; Van den bulte and wuyts 2007). Particularly, several sustainability frameworks have been introduced over the past ten years to help focal firms to choose effective RMS through various governance mechanisms and a set of sustainability practices in the SCN (Awaysheh and Klassen 2010; Crespin-Mazet and Dontenwill 2012; Kumar et al. 2017; Meinlschmidt, Schleper and Foerstl 2018; Parmigiani, Klassen and Russo 2011; Tachizawa and Wong 2014; Vachon and Klassen 2006; Vurro, Russo and Perrini 2009). All these researchers see the SCN structure as a key factor in the effective implementation of sustainability practices in the SCN. However, they have not clearly explained how the SCN structure can play a role in improving sustainability in the SCN. In the next section, a conceptual framework is developed to potentially fill the gap that focuses on deciding effective RMS in which appropriate types of sustainability practices need to be implement in the SCN.

Towards a conceptual framework for sustainable supply chain networks

Focal firms need to develop different RMS to implement sustainability practices its SCN based on the SCN structure. These strategies can be defined as behaviour and thoughts in which focal firms categorise their set of sustainability practices. A conceptual framework has been designed (Figure 1) to fully exploit the potential of the existing pattern of interactions among SCN actors in order to make a focal firm's SCN more sustainable. This model suggests that focal firms can incorporate sustainability practices into its SCN based on the various types of RMS. In addition, considering the SCN structure as being a critical factor (for the process of implementing sustainability practices) can help focal firms identify effective RMS (which includes a set of specific sustainability practices) to improve sustainability in their SCN. Various components of the conceptual framework will be explained in the following sections.

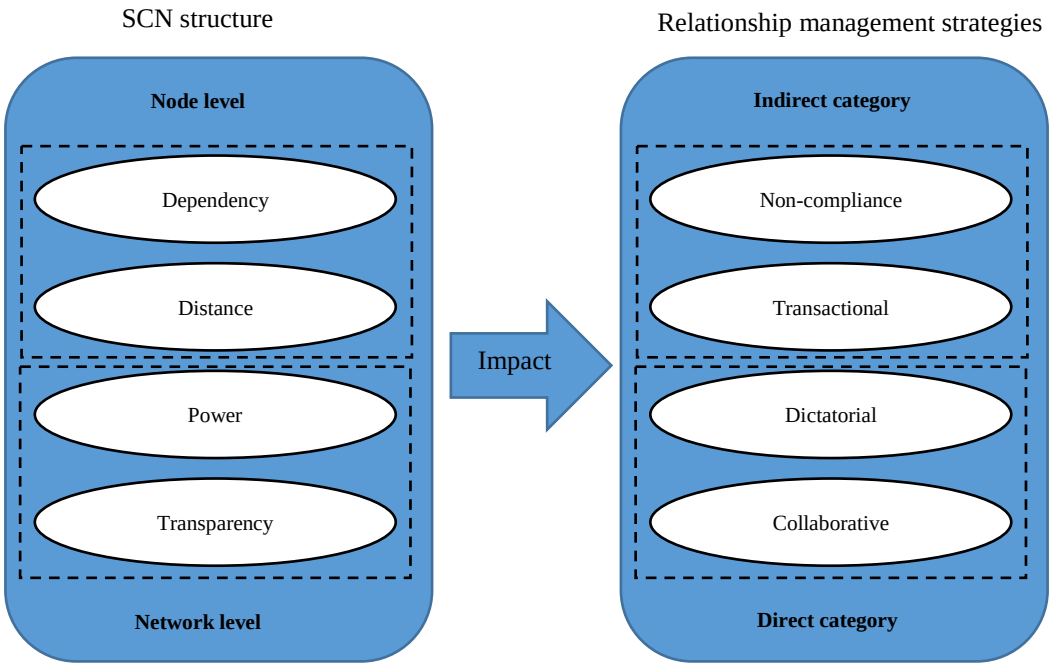

Figure 1. Conceptual framework

Categorising various sustainability practices into relationship management strategies

Based on a comprehensive review of the IMP, SSCM, SCN, and marketing literature, this paper evaluates how focal firms approach their SCN actors to manage sustainability issues, extends the work of Vurro, Russo and Perrini (2009) by emphasising the sustainability practices which large focal firms apply to their SCN, and categorises various sustainability practices in the literature into four distinct RMS, including 'non-compliance', 'transactional', 'dictatorial', and 'collaborative'.

Non-compliance

In a non-compliance RMS, the focal firms typically do not have the intention to make efforts to influence the SCN actors regarding sustainability issues. In other words, this type of RMS fails to address the demands for sustainability requirements from stakeholders, and the focal firms do not pay attention to the sustainability issues in their relationships with the SCN actors (Lee and Ball 2003; Meinlschmidt, Schleper and Foerstl 2018; Wilhelm et al. 2016b). The practices in this strategy may best apply to the less complex SCN or the firms that are not too visible by the end-user (Caridi et

al. 2010; Parmigiani, Klassen and Russo 2011; Wilhelm et al. 2016b). The focal firms that are under less pressure from various institutions have the tendency to be followers and looking for the conservative approach such as implementing successful practices after they are validated by pioneer firms (Simpson, Power and Samson 2007). In addition, the focal firms in this strategy often have limited power when compared to other actors in the SCN (Esty and Winston 2009). They do not usually have sufficient financial or technical resources to urge their SCN actors to make them more sustainable (Delmas and Montiel 2009). Furthermore, this strategy may be useful when the information exchange with the SCN actors is more costly, ineffective, and uneconomical (Simpson, Power and Samson 2007; Vurro, Russo and Perrini 2009). However, ignoring sustainability issues in this type of relationship may have dire consequences such as losing support from influential NGOs (e.g. World Wide Fund and Rainforest Alliances) which has the potential to damage the focal firm's reputation (Kumar et al. 2017). In contrast, involving numerous SCN actors with sustainability practices can add more complexity to the SCN, which makes it more difficult for the focal firms to control these practices (Sarkis, Zhu and Lai 2011), therefore, potentially providing further benefits to focal firms (Kim et al. 2011).

Transactional

In a transactional RMS, the focal firms pay more attention towards pursuing sustainability issues. However, by adhering to the minimum standards and requirements compliant with regulations, the focal firms often seek only a minimum level of sustainability commitment (Lee and Ball 2003). In other words, by employing arm's-length interactions with the SCN actors, the focal firms seek short-term commitments and a low level of information sharing (Vurro, Russo and Perrini 2009). This may happen when the focal firms identify that these actors are not key players in their business environment or the focal firms have not sufficient power to influence those actors. For example, MacCarthy and Jayarathne (2012) indicated how successfully a supermarket retailer (a focal firm) used arm's length interactions (such as limited concern for monitoring the well-being of employees) to manage sustainability issues in their SCN. In the case of environmental sustainability,

environmental monitoring practices often concentrate on the outcomes of environmental initiatives (Paulraj and Blome 2017). For example, having certifications such as receiving ISO 14001 or EMAS, or being compatible with a specific legislation such as hazardous materials labeling and greenhouse gas emissions, or preparing the environment-related documentation (Vachon and Klassen 2006). To employ sustainability practices in the transactional strategy, the focal firms usually gather and process the SCN actors' information via publicly disclosed documentation or auditing by another actor (Min and Galle 2001; Meinlschmidt, Schleper and Foerstl 2018; Wilhelm et al. 2016b). For example, the focal firm can collaborate with NGOs to use their databases for monitoring its lower-tier suppliers (Miemczyk, Johnsen and Macquet 2012). The focal firms may ask their first-tier suppliers to improve the sustainability performance of their second-tier suppliers (Aßländer, Roloff and Nayır 2016). Wuyts and Van den Bulte (2012) name this approach "two-step" leverage in which focal firms call their first tier suppliers to influence on their second tier suppliers. Therefore, in this strategy, focal firms do not tend to put a high level of energy and time into the management of sustainability issues of their SCN actors.

Dictatorial

"A dictatorial solution is one in which the will of one individual always prevails" (Heal 1998, 8). The sustainability practices in this RMS often emerge when the focal firm has more power than its SCN actors, and because of its dominance, the focal firm can force the other actors to follow its edicts (Drucker and Noel 1986), and use their own resources to audit sustainability standards on a regular basis (Meinlschmidt, Schleper and Foerstl 2018). The auditing process may include various forms such as investigating waste, emissions, and working conditions (Bridges and Wilhelm 2008). The focal firms apply more proactive approaches as they become aware of the potential benefits that can be achieved from a commitment to sustainability (Lee and Ball 2003). In this strategy, the focal firms usually impose some norms, standards and practices (either created by themselves or that come from regulations) to manage sustainability issues throughout the SCN (Neville and Menguc 2006) and establish a

set of procedures to implement them (Andersen and Skjoett-Larsen 2009). For example, Nike developed its own workforce and environmental standards to monitor the social and environmental issues of its suppliers (Awaysheh and Klassen 2010) or in another case, IKEA instituted its own corporate social responsibility (CSR) certificate to ensure that sustainability requirements were followed by its suppliers (Andersen and Skjoett-Larsen 2009). In other words, since the SCN actors cannot exert influence over the focal firms, the latter adopt the role of commander, setting the rules of sustainability issues for the SCN actors and urging them to follow the rules (Vurro, Russo and Perrini 2009). This condition can also create competition among SCN actors to follow the focal firms' instructions which in turn may impact on their future contracts with the focal firms (Wuyts and Van den Bulte 2012). For example, Sa Vinhas and Heide (2014) examine how different forms of competition among distributors and manufacturers can be beneficial to the buyers. By having the ability to make decisions independently through exerting economic and non-economic influences (Parmigiani, Klassen and Russo 2011), the focal firms can create pressure on their customers as well as suppliers (Maloni and Benton 2000). They can design incentive programs to encourage the desired behaviour and/or penalise non-compliance (Wathne and Heide 2004) (for a detailed overview, see Kishore et al. (2013). For example, as part of the supplier relationship management process, the focal firms can apply incentives (Andersen and Skjoett-Larsen 2009) or sanctions for supplier evaluation results (Peters 2010). In the most extreme case, the negative outcome can be accompanied by the termination of the business relationship (Delmas and Montiel 2009; Pullman et al. 2017; Ghosh and John 2009; Cui, Calantone and Griffith 2011), although, collaborating in sustainability practices rather than sanctions may result in the better sustainability performance (Aßländer, Roloff and Nayır 2016). Accordingly, this strategy is concerned with dictating instructions to the SCN actors to achieve desired outcomes.

Collaborative

The sustainability practices of a collaborative RMS are those that include both focal firms and others in the SCN directly implementing agreed upon approaches and are

typically concerned with mutual sustainability outcomes for both involved parties. Collaboration is seen as a cornerstone to improving sustainability performance (Paulraj and Blome 2017; Soosay and Hyland 2015; Paulraj and Blome 2017), and can be considered a core theme of the marketing relationship (Chu, Chang and Huang 2011). Wathne and Heide (2004) found that collaborating with suppliers through supplier qualification programs can increase the ability of the focal firms to adopt uncertainty in their customer relationship management process. The focal firms develop the collaborative relationships with multi-stakeholders in terms of various joint rules (such as knowledge sharing) to make their SCN more sustainable (Vurro, Russo and Perrini 2009; Watson et al. 2018). For example, seller investments and customer investments can play a key role in improving the strength of buyer-seller relationships (Boyle et al. 1992) between two firms (Zhang et al. 2016). These joint efforts and mutual investments can have considerable impact on ex-post transaction costs (Wathne et al. 2018). Zhang, Pawar and Bhardwaj (2017) argue that supplier development program such as collaboration and training can be positively effective in enhancing supply chain sustainability. In addition, by entering into a close partnership with the key SCN actors (both business and non-business actors), the focal firms can add more sustainability legitimacy to its reputation (Crespin-Mazet and Dontenwill 2012; Wilhelm et al. 2016b). For example, the focal firm may create a collaborative relationship with a lower tier supplier through providing training on how to adopt cleaner production methods and, at the same time, work closely with an non-governmental environmental organisations (NGO) to generate a specific environmental standard (Tachizawa and Wong 2014; Wilhelm et al. 2016b). In another example, cross-national collaboration of multinational companies can be significantly effective in building new product advantage (Griffith and Lee 2016), which can be considered as a main part of the sustainable product life cycle. Crespin-Mazet and Dontenwill (2012) conducted a case study and explained how the focal firm signed an agreement to buy materials at a certain volume and price from its suppliers to encourage cultivating plants in compressed clods. The focal firm can also develop a partnering relationship with non-business actors such as militant organisations to create a corporate legitimacy (Crespin-Mazet and Dontenwill 2012). Therefore, focal

firms that apply this strategy spend many resources to manage sustainability in their SCN.

Potential for a hybrid approach

The focal firms may also use one or more of the four RMS to improve sustainability in their SCN simultaneously. For example, a focal firm may: (1) keep the existing relationship, regardless of sustainability improvement within it (non-compliance), (2) seek for minimum requirement of social and environmental standards in lower-tier suppliers with the help of third parties (transactional), (3) force suppliers to implement environmental management systems (dictatorial), (4) extend the business volume with some existing suppliers who already meeting sustainability requirements (dictatorial, collaborative), and (5) develop close partnerships with NGOs, activists and militant organisations (collaborative). This means that the focal firms may develop and maintain different types of relationships (through various sustainability practices) with both upstream and downstream actors that form their own network environment to achieve competitive advantage (Chang, Chiang and Pai 2012; Meinlschmidt, Schleper and Foerstl 2018).

Factors to conceptualise the supply chain network structure

The analysis of the SCM context in which sustainability practices are implemented from the network perspective can determine which RMS are most effective to implement sustainability practices (Tachizawa and Wong 2014). Studies on the sustainable development concept that incorporate the network perspective into the SCM, such as that of Frostenson and Prenkert (2015), highlight the fact that firms need to understand the embeddedness of SCN actors since it can limit individual firms' actions to manage sustainability issues (Miemczyk, Johnsen and Macquet 2012). Thus, the structure or pattern of interactions among the firms and its SCN actors can influence the behaviour of the firms regarding managing sustainability issues within the network (Roscoe, Cousins and Lamming 2016; Pullman et al. 2017). This means focal firms need to analyse the structure of the SCN to find an appropriate set of sustainability practices through effective RMS.

The pattern of interactions in the network can be analysed at two levels. The first level, which is called node level (Bellamy and Basole 2013), is about how a firm is in control of other SCN actors (such as the focal firm) and is concerned with the management of interactions between two SCN actors (Ritter, Wilkinson and Johnston 2004). This is similar to the network centrality in the social network context in which a firm's access to other actors in the SCN can be measured (Srinivasan, Wuyts and Mallapragada 2018; Van den Bulte and Wuyts 2007). The second level, which is called the network level (Bellamy and Basole 2013), is about how a firm can influence and be influenced regarding the function of the whole network (Ritter, Wilkinson and Johnston 2004). "The extent to which actors in the SCN are connected to each other and their relative position matter in shaping reciprocal influences and acceptance within the network" (Vurro, Russo and Perrini 2009, 612). For example, a focal firm with low power over a SCN actor may result in a lack of influence over its practices (node level), and a SCN actor's poor interconnectedness within the network can impede the transmission of stakeholder pressure on its performance (network level) (Gualandris and Pagell 2015). Thus, how much a focal firm can address sustainability issues within a specific SCN actor depends largely on the level of influence it has on the other SCN actors and also the level of information that other SCN actors (stakeholders) can access regarding this SCN actor (Parmigiani, Klassen and Russo 2011).

Due to the importance of the level of influence and level of information availability in developing strategic actions of managing sustainability issues to successfully respond to competition within the SCN (Chang, Chiang and Pai 2012; Parmigiani, Klassen and Russo 2011; Vurro, Russo and Perrini 2009), this paper extends the work of Awaysheh and Klassen (2010) by analysing the supply chain structure from the network perspective, and suggests there are four factors which can affect the type of RMS to improve sustainability of the SCN. These factors can be used to conceptualise the pattern of interactions in the SCN structure, and consequently have significant impacts on the RMS chosen by the focal firms in the sustainability context: dependency, distance, power, and transparency. This paper applies these four factors, by examining

two levels of influence and information availability from both the node and network level.

The level of influence in a dyadic relationship can be characterised by the dependency which comes from a power imbalance (asymmetrical interdependence) that happens if one firm is more dependent than the other firm (Touboulic, Chicksand and Walker 2014; Gundlach and Cadotte 1994). Therefore, at the node level, "power is deeply rooted in interdependence, so the more dependent one actor is on another, the more power the latter has over the former" (Egels-Zandén, Hulthén and Wulff 2015, 101). This means in the two firm relationships, dependency can be considered the obverse of power (Emerson 1962). However, power is not limited to a dyadic relationship in which two actors interact but also resides within the network in which the firm is embedded and can affect the firm's strategies and behaviour (Meqdadi, Johnsen and Johnsen 2016). Therefore, the level of influence at the network level can be characterised by the power which can come from a variety of resources such as having a high market share or highly differential technology (Chang, Chiang and Pai 2012).

The level of information availability at the node level can be characterised by the distance between two actors. Indeed, the access to effective information and knowledge from various SCN actors can be eased for focal firms by the length of the path between them (Bellamy, Ghosh and Hora 2014). The level of information availability at the network level can be characterised by the firm's transparency which can take the form of, for example, sustainability reports, environmental product declarations, and sustainability certifications (Egels-Zandén, Hulthén and Wulff 2015). The transparency reflects the degree that the information is available in appropriate quantity and quality for all the firm's stakeholders (SCN actors) (Wognum et al. 2011), and can be considered as a "foundational tool" for addressing stakeholder pressure and improving responsible management practices (Parris et al. 2016, 223). Thus, to survive in the competitive marketplace, firms need to respond to stakeholder pressure by information processing and increased transparency to positively improve the firms' reputation (Wognum et al. 2011; Gouda and Saranga 2018).

Those factors are categorised in two levels. At the node level, the level of influences can be identified by how much a SCN actor is dependent on the focal firm, and the level of information availability can be identified by how much distance exists between the focal firm and a SCN actor. At the network level, the level of influences can be identified by how much a SCN actor is considered powerful in the network, and the level of information availability can be identified by how much a SCN actor is transparent.

Dependency

In the SCN, dependency is concerned with the extent to which a firm relies on the other actors of the SCN for their resources and capabilities (Awaysheh and Klassen 2010; Frazier 1983a, b; Frazier, Gill and Kale 1989). This means the firm's power within the reciprocal relationships is driven by its dependence on other firms (Frazier, 1983a; Frazier et al. 2009). For example, a dealer's dependence on its manufacturer can be based on the sales volume contributed by the manufacturer (Frazier, Gill and Kale 1989). Dependency theory (Pfeffer and Salancik 1978) suggests that as the number of potential suppliers for a firm reduces, the firm's influences decrease. This factor can have a significant impact on the focal firm's behaviour (Jorge and Jerónimo 2017; Salonen and Gabrielsson 2012; Meinlschmidt, Schleper and Foerstl 2018; Wilhelm et al. 2016b), and can be best understood through the social relationships context (Narasimhan et al. 2009). Ritter, Wilkinson and Johnston (2004) presented a model which categorises four types of relationships between two firms in the network based on how they are dependent on each other. For example, inequity in a buyer-supplier relationship can significantly affect the extent of resources that the supplier shares with its buyer (Griffith et al. 2017). The focal firm has a limited ability to influence and control changes in the operations of its suppliers if the focal firm is highly dependent on its suppliers (Awaysheh and Klassen 2010). Indeed, signalling by the focal firm is less likely to motivate the suppliers' actions regarding the specific objectives if the focal firm is dependent on the supplier (Dixit and Nalebuff 1993). In particular, focal firms may follow sustainable development objectives to find

legitimate suppliers and reduce their dependence to the suppliers which have sustainability incursions (Connelly, Ketchen and Slater 2011).

The role of the dependency in the SCM context has gained considerable attention among researchers (Griffith et al. 2017; Hoejmose, Grosvold and Millington 2013; Steinle, Schiele and Ernst 2014), particularly in the application of the SSCM practices (Meinlschmidt, Schleper and Foerstl 2018; Tachizawa and Wong 2014; Wilhelm et al. 2016b). For example, Awaysheh and Klassen (2010) argued that as the dependency on the customers increases, the focal firms have more tendency to apply socially responsible practices. This is mainly because the extent of the influence that customers can exert on the focal firm to follow sustainability practices (Delmas and Montiel 2009). However, they could not find enough evidence to find such a relationship when the focal firms were dependent on their suppliers. In a comprehensive literature review, Tachizawa and Wong (2014) identified dependency as being the main variable which can affect the approaches chosen by the focal firm to manage sustainability issues in their SCN. Similarly, in the marketing research studies, dependency has been recognised as a focal factor which can affect firms' strategy, behaviour and economic outcomes (e.g., Frazier 1983a, b; Frazier et al. 1989; Frazier and Rody 1991; Heide and John 1988; Hibbard et al. 2001; Kumar et al. 1995; Lusch and Brown 1996; Scheer, Miao and Palmatier. 2015). For example, dependency on suppliers can affect the level of governance mechanisms which is elected by focal firms (Gilliland, Bello and Gundlach 2010), and also increase focal firm's loyalty to the suppliers (Scheer, Miao and Garrett 2010). Scheer, Miao and Palmatier. (2015) found that dependency has substantial effects on the quality of relationship and cooperation. This leads to the significant role of dependency in the focal firms' RMS. As previously discussed, focal firms apply four types of RMS (non-compliance, transactional, dictatorial, and collaborative) to manage sustainability issues within their SCN. Therefore, this paper argues that dependency can affect each RMS. The effects can be captured in the following propositions:

P1a: Dependency can affect the focal firms' use of non-compliance RMS to manage sustainability issues in the SCN.

P1b: Dependency can affect the focal firms' use of transactional RMS to manage sustainability issues in the SCN.

P1c: Dependency can affect the focal firms' use of dictatorial RMS to manage sustainability issues in the SCN.

P1d: Dependency can affect the focal firms' use of collaborative RMS to manage sustainability issues in the SCN.

Distance

As distance increases, focal firms have some difficulties related to data gathering, evaluation, and implementation (Klassen and Vachon 2003), which can affect the focal firms' incurred cost (Liu, Bui and Leach 2013). Closeness can be referred to as the intensity of interaction between a focal firm and its SCN actors such as suppliers which can vary from an arm's-length relationship to close collaboration (Wuyts and Geyskens 2005). Three sub-factors can conceptualise the distance in the SCN, including geographical distance which is related to the physical distance between the actors in the SCN (Griffith and Dimitrova 2014; Watson et al. 2018), cultural distance which refers to the cultural differences that exist between the societies in which the firms are located (Grewal et al. 2018; Tihanyi, Griffith and Russell 2005), and organisational distance which is concerned with the number of tiers that exists among the various actors in the SCN (Awaysheh and Klassen 2010; Parmigiani, Klassen and Russo 2011; Roth et al. 2008). As the distance between the actors in the SCN increases, focal firms make more effort in coordination activities (Mares 2010; Simpson, Power and Samson 2007; Bellamy, Ghosh and Hora 2014; Carter, Rogers and Choi 2015). This may happen due to the numerous difficulties in establishing trust and developing rich exchanges of information as a result of too much distance, making it more complex to create an environment for coordination and collaboration (Parmigiani, Klassen and Russo 2011).. For example, two manufacturing plants which are located in two different countries may share a similar standard of workplace conditions as they are both owned by a parent firm (small cultural differences) or in another case, they may be located in the same area but each of them is owned by focal

firms from two different countries (large cultural differences). Griffith and Dimitrova (2014) found that effective interfirm communication is essential to reach the maximum benefits of strong relational networks. Distance can also be considered as a significant factor in determining the nature of an international interfirm marketing collaboration (Dahlquist and Griffith 2015). Therefore, the effect of this factor on SSCM needs to be analysed (Dubey, Gunasekaran and Papadopoulos 2017; Meinlschmidt, Schleper and Foerstl 2018; Wilhelm et al. 2016b).

Similarly, a multi-industry survey among Canadian focal firms shows a positive relationship between the length of SC and the adoption of socially responsible practices. Indeed, as the number of tiers increases, complexity and uncertainty increases, and focal firms adopt more complex monitoring systems (such as auditing social issues based on the standards) to manage sustainability issues (Awaysheh and Klassen 2010). In addition, Hoejmose, Grosvold and Millington (2013) argued that both joint dependency and buyer power become increasingly significant determinants of socially responsible practices as geographical distance increases. This means distance can be a significant factor which can affect the types of relationships the focal firms can choose in their SCN (Tachizawa and Wong 2014). Therefore, considering the arguments offered previously on four types of RMS that focal firms apply to manage sustainability issues within their SCN, the following proportions are suggested:

P2a: Distance can affect the focal firms' use of non-compliance RMS to manage sustainability issues in the SCN.

P2b: Distance can affect the focal firms' use of transactional RMS to manage sustainability issues in the SCN.

P2c: Distance can affect the focal firms' use of dictatorial RMS to manage sustainability issues in the SCN.

P2d: Distance can affect the focal firms' use of collaborative RMS to manage sustainability issues in the SCN.

Power

In the SCN, power is a firms' ability to influence and control other actors (Pilbeam, Alvarez and Wilson 2012; Frazier and Antia 1995), and can provide efficent outcomes in the bargaining process (Dwyer and Walker 1981). However, imbalanced power may result in creating asymmetrical outcomes such as reducing the SCN actors' satisfaction with the relationships (Reve and Stern 1979). Power can come from various resources, such as having a high market share, high growth demand, highly distinctive technology, critical components and products, high prestige and reputation, and being in a high concentrated and consolidated part of the industry structure (Chang, Chiang and Pai 2012). These aspects can affect the relationship success of the actors in the supply chain (Bandara et al. 2017), and have been considered a great area of interest for business-to-business marketing researchers (Johnsen and Lacoste 2016). Huxham and Beech (2008) consider resources and legitimacy as being the two main sources of power for focal firms. For example, possessing access to rare resources can provide more power for the focal firms in their SCN (Alvarez, Pilbeam and Wilding 2010). In addition, developing various relationships with the SCN actors, which are legitimate (for example, in the case of sustainability), gives the focal firms more power to influence the other SCN actors to follow up their own policies (Crespin-Mazet and Dontenwill 2012). Having valuable resources and the position of the focal firm in the SCN (customers' customer, customer, supplier, suppliers' supplier) can be considered as two sources of the power (Mena, Humphries and Choi 2013). Similarly, a firm's structural position within its SCN can affect the firm's power and influence over the other actors within the SCN (Kim et al. 2011). In comparison to dependency, power is not limited to a dyadic relationship in which two actors interact but also resides within the network in which the firm is embedded and can affect the firm's strategies and behaviour (Chang, Chiang and Pai 2012; Meqdadi, Johnsen and Johnsen 2016).

Within the SCN, power plays a critical role in the adoption of sustainability practices (Meinlschmidt, Schleper and Foerstl 2018; Tachizawa and Wong 2014; Wilhelm et al. 2016b) and particularly can affect the depth of the collaboration between the focal firms and the other SCN actors (Kähkönen 2014). For example, a powerful focal firm

can urge the necessary sustainability standards are met by suppliers (Ciliberti et al. 2009), and in contrast, the lack of sufficient power over the suppliers can limit the enforcement of sustainability practices in the SCM (Hoejmose, Grosvold and Millington 2013). This means when a focal firm seeks to coerce a supplier (to comply with their required instruction) without providing sufficient direct or indirect rewards, the supplier may not perceive this compliance worthwhile and may select to terminate the relationship (Dwyer, Schurr and Oh 1987). This means considering power as being a significant factor can help focal firms to decide which types of relationships can be effective under specific circumstances (Narasimhan et al. 2009; Tachizawa and Wong 2014). Regarding the previous arguments of four types of RMS that focal firms apply in the sustainability context, the following propositions are suggested:

P3a: Power can affect the focal firms' use of non-compliance RMS to manage sustainability issues in the SCN.

P3b: Power can affect the focal firms' use of transactional RMS to manage sustainability issues in the SCN.

P3c: Power can affect the focal firms' use of dictatorial RMS to manage sustainability issues in the SCN.

P3d: Power can affect the focal firms' use of collaborative RMS to manage sustainability issues in the SCN.

Transparency

Transparency refers to the degree to which information is readily available to the public, the end-consumers, and the other actors within the SCN (Awaysheh and Klassen 2010). For example, as the institutional pressure becomes more intense, focal firms become more visible to the media (Simpson, Power and Klassen 2012). In this regard, focal firms typically show more intention towards the proactive approach to adopt the sustainability practices in their SCN (Esty and Winston 2009; Meinlschmidt, Schleper and Foerstl 2018; Wilhelm et al. 2016b). Large firms with visible brand names may pay more attention to protecting themselves against the criticism of social

issues in their SCN (Awaysheh and Klassen 2010). Therefore, the extent to which the SCN actors are transparent or subjected to various stakeholders such as the public, the media, and NGOs can influence the degree to which a focal firm proactively applies the sustainability practices, for example, related to social issues (Awaysheh and Klassen 2010).

Similarly, Parmigiani, Klassen and Russo (2011, 215) used accountability to refer to the concept of transparency and define it "as the extent to which firms are required or expected to justify their decisions and actions for product design, sourcing, production or distribution to stakeholders". They argue that this factor is a pivotal construct for focal firms to help them in deciding which types of approaches they need to choose to manage the sustainability issues in their SCN (the higher accountability, the higher motivation towards a proactive approach to the management of sustainability issues) (Parmigiani, Klassen and Russo 2011). This means transparency can be recognised as a key factor which has a significant effect on the focal firms' RMS (Awaysheh and Klassen 2010; Tachizawa and Wong 2014). Considering the four types of RMS that focal firms apply to manage sustainability issues within their SCN, the following propositions are sugested:

P4a: Transparency can affect the focal firms' use of non-compliance RMS to manage sustainability issues in the SCN.

P4b: Transparency can affect the focal firms' use of transactional RMS to manage sustainability issues in the SCN.

P4c: Transparency can affect the focal firms' use of dictatorial RMS to manage sustainability issues in the SCN.

P4d: Transparency can affect the focal firms' use of collaborative RMS to manage sustainability issues in the SCN.

Table 1 provides the connections among the major constructs in this paper and highlights the authors who have investigated the respective connections.

Table 1. Researchers who have investigated the connection among the conceptual framework's constructs

SCN structure	RMS	References
Dependency	Non-compliance	(Wilhelm et al. 2016b)
	Transactional	(Awaysheh and Klassen 2010; Jorge and Jerónimo 2017)
	Dictatorial	(Connelly, Ketchen and Slater 2011)
	Collaborative	(Jorge and Jerónimo 2017; Awaysheh and Klassen 2010)
Distance	Non-compliance	-
	Transactional	(Awaysheh and Klassen 2010; Klassen and Vachon 2003)
	Dictatorial	
	Collaborative	(Awaysheh and Klassen 2010; Klassen and Vachon 2003; Hoejmose, Grosvold and Millington 2013; Parmigiani, Klassen and Russo 2011)
Power	Non-compliance	-
	Transactional	(MacCarthy and Jayarathne 2012)
	Dictatorial	(Andersen and Skjoett-Larsen 2009; Ciliberti et al. 2009; Hoejmose, Grosvold and Millington 2013; Neville and Menguc 2006; Peters 2010)
	Collaborative	(MacCarthy and Jayarathne 2012; Parmigiani, Klassen and Russo 2011)
Transparency	Non-compliance	(Parmigiani, Klassen and Russo 2011)
	Transactional	(Awaysheh and Klassen 2010; Parmigiani, Klassen and Russo 2011; Wilhelm et al. 2016b)
	Dictatorial	(Parmigiani, Klassen and Russo 2011)
	Collaborative	(Awaysheh and Klassen 2010; Grimm, Hofstetter and Sarkis 2016; Wilhelm et al. 2016b)

Discussion

There are also other factors that determine the pattern of interactions in the SCN structure that can affect the type of approach that firms apply to manage sustainability issues in the SCN. For example, Tachizawa and Wong (2014) identified seven factors

that can affect the type of sustainability practices that a firm employs in the SCN. However, aside from power, stakeholder pressure, dependency, and distance, the other three factors (material criticality, industry, and knowledge resources) are not directly related to the pattern of interaction in the SCN structure, and indeed, are partly covered by other four factors. For example, being in a more static or dynamic industry context can be mediated by stakeholder pressure (Betts, Wiengarten and Tadisina 2015), and material criticality in the form of resource scarcity (Touboulic, Chicksand and Walker 2014). Knowledge resource in the form of expertise and skills can also be considered as one of the power sources (Schneider and Wallenburg 2012). Awaysheh and Klassen (2010) applied three factors (transparency, dependency, and distance) to characterise the structure of the SC to identify the impact of the structure on the use of supplier socially responsible. However, in their study, they did not explain the extent to which how much the actors in the SC context are considered to be powerful from the perception of other SC actors, which can affect the form of relationship chosen by the focal firm (Kähkönen 2014). Caridi et al. (2010) suggested virtuality and complexity as being two main features of the SCN configuration. However, the virtuality, which can be measured by "the amount of supply chain activities that are external to the focal firm" (Caridi et al. 2010, 376) can be covered by dependency (Hoejmose, Grosvold and Millington 2013). The complexity which can be measured by "the number of connections among the nodes" (Caridi et al. 2010, 376), can be covered by the power (Kim et al. 2011). Bellamy, Ghosh and Hora (2014) found two important structural characteristics of the SCN (accessibility and interconnectedness) that may affect the flow of information and knowledge between SCN actors. The SCN accessibility, which can be defined as "how effectively a firm is able to access the different sources of information and knowledge assets in the network", can be covered by the distance (Bellamy, Ghosh and Hora 2014, 359). The SCN interconnectedness which can be defined as "how these sources of information and knowledge are structurally inter-linked together in the network" (Bellamy, Ghosh and Hora 2014, 359), can be covered by the transparency of the SCN (Turcu, Graur and Turcu 2009).

As seen in Figure 1, to improve sustainability in the SCN, the focal firm must choose one or more RMS which consequently provide the main framework to select the specific types of sustainability practices. These RMS are divided into two categories. The indirect category which includes non-compliance and transactional RMS are applied when the focal firm uses another resource (such as third parties, NGOs) to manage sustainability issues in its SCN actors. In contrast, in the direct category which includes dictatorial and collaborative RMS, the focal firm uses its own resources and directly involves in the process of managing sustainability issues in its SCN actors. In this process, the focal firm must consider the impact of the SCN structure on the RMS, as the various pattern of interactions among the actors in the SCN can provide different conditions for the focal firm to choose RMS. This implies that based on the combination of analysis at the node level (which can be examined by dependency and distance) and at the network level (which can be examined by power and transparency) for each actor in the SCN structure, the focal firm can identify which types of RMS are effective for the SCN actor to implement sustainability practices. For example, to make the SCN more sustainable, a retailer may begin with the analysis of the pattern of interactions among the various actors in the SCN. By interpreting each SCN actor's position (based on how much the actor is dependent on the retailer, has distance to the retailer, has the power, and is transparent to the whole network), the retailer can identify which actor has to be chosen for, for example, more fierce approach. Accordingly, the retailer may add some standards of workplace conditions in their supplier relationship management process to force those small suppliers to follow up such as sustainability practice. The same analysis needs to be conducted when the retailer wants to collaborate with the key suppliers to jointly run mutual projects, such as a NPD process, marketing, or manufacturing activities that use recyclable materials. In this regard, the focal firm can save time and money by assigning the appropriate type of sustainability practices through an effective RMS to each SCN actor to manage the sustainability issues across the SCN.

Conclusion and implications

This paper addresses gaps in the IMP, SSCM, SCN, and marketing literature by providing a novel conceptual framework, based on the network-based approach, in the SSCM context to help focal firms determine the appropriate type of industrial marketing relationships to achieve their sustainable development objectives. In addition, studies that analyse SSCM from the network perspective highlight that a focal firm needs to recognise its embeddedness within the wider stakeholder network (Miemczyk, Johnsen and Macquet 2012). This implies the significant influences of the structure or pattern of interactions between the focal firm and its SCN actors on the way the focal firm treats each actor in the network to manage sustainability issues (Roscoe, Cousins and Lamming 2016), which have been neglected in the SSCM literature (Meinlschmidt, Schleper and Foerstl 2018). In doing so, this paper advances the understanding of a SCN structure in the literature by analysing how the construction of interactions among the SCN actors can affect the focal firm's decisions to find effective RMS which can lead to the appropriate types of sustainability practices.

This paper has shown how focal firms can incorporate sustainable development objectives into their SCN. By examining the IMP, SSCM, SCN, and marketing literature, the importance of having a network perspective in the SSCM context and creating the effective RMS to access to the valuable resources required for the sustainable development objectives has been highlighted. Accordingly, various types of sustainability practices, have been reviewed and based on the way focal firms treat their SCN actors when managing sustainability issues, they are categorised into one of the four distinct RMS (non-compliance, transactional, dictatorial, and collaborative). Then, to explain how the focal firms can identify which types of RMS are effective to implement specific types of sustainability practices, this paper emphasised the role of the SCN structure which consists of the pattern of interrelated actors in the focal firms' SCN.

To analyse the SCN structure more precisely, four sub-factors were identified (transparency, dependency, distance, and power) which may help focal firms to

conceptualise the SCN structure. Finally, in the last section, a conceptual framework was provided to help focal firms in the process of incorporating sustainable development objectives into their SCN. By presenting the conceptual framework, this paper argues that to make the SCN more sustainable, the focal firms need to develop and maintain different types of RMS (set of sustainability practices). More importantly, the conceptual framework highlights that the focal firms need to consider the impact of the SCN structure on the RMS to make improvement in the sustainable development objectives in their SCN. This means that the focal firm can use the model to decide on the specific structure in its SCN, and which appropriate types of sustainability practices have to be employed in which business processes. Accordingly, 16 propositions are outlined, which explain the effect of SCN structure on the types of RMS required to incorporate the sustainable development objectives into focal firms' SCN and recommend that researchers test the propositions using an empirical data for validation.

Limitations and future research

The main limitation of this paper relates to the propositions, which were developed from the existing literature, therefore, conducting empirical studies such as an in-depth case study, and a survey on a large scale can help validate the propositions. Another limitation is concerned with the position of the focal firms in their SCN, which can affect the ability of the focal firms to diffuse sustainability practices throughout their SCN (Tachizawa and Wong 2014). This paper mainly explores the large firms' different use of sustainability practices and how they interact with their different SCN actors. However, the impact of the patterns of interactions (among various SCN actors) on the focal firms' position has not been addressed. Since analysing network of interconnected firms can be effective in the diffusion of sustainability practices (Connelly, Ketchen and Slater 2011), using theories such as social network theory (Wuyts and Van den Bulte 2012; Tracey, Heide and Bell 2014) and methods such as social network analysis (Chang, Chiang and Pai 2012; Wichmann and Kaufmann 2016) could provide a foundation for future research. This allows researchers to analyse the central position of the focal firms in their SCN, the distribution of the

power among SCN actors, and potentially support this paper's conceptual framework by providing metrics that could be quantified, analysed and visualised. Combining this paper's conceptual framework with other existent framework such as governance value analysis (GVA) proposed by Ghosh and John (2012) can be other valuable venue for future research to consider sustainability in the RMS. This paper did not consider the effect of time duration on the RMS. Since relationships can be changed over their life cycle (Dwyer, Schurr and Oh 1987; Griffith et al. 2017), examining this conceptual framework via longitudinal methodology design can be a suitable area for future research.

Disclosure statement

No conflict of interest was reported by the authors.

Implications for business marketing practice

Although this paper is conceptual and the are no empirical results, industry professionals can benefit from the conceptual framework and propositions outlined in this paper. According to Wolf (2014), firms are in need of a structured framework to help achieve sustainable development objectives. This is also important as incorporating sustainability principles into different business practices have entered the education context (for example see Bridges and Wilhelm 2008). In this regard, the development of this paper's conceptual framework and application to the focal firm's SCN, provides useful considerations for both marketing managers and supply chain managers. Firstly, by analysing the position of various types of actors (such as customers, manufacturers, suppliers, NGO) in the SCN via the four identified factors related to the SCN structure (dependency, distance, power, transparency), these managers can identify the key network actors that can have a considerable impact on the sustainability of the SCN. Each SCN actor may for example, have different impacts on the sustainability performance of the focal firms such as how powerful suppliers can affect the sustainability of the SCN as they have more influence on the relationships with other actors in the SCN. By identifying these powerful suppliers in the network, managers can facilitate the process of improving sustainability by promoting appropriate types of relationships such as partnerships and joint initiatives

related to sustainable development objectives. Having mutual sustainability-related projects in different contexts can be beneficial for both sides (focal firm and its SCN actor), as seen for example, how marketing managers can benefit from collaborating with powerful suppliers to make sustainable NPD decisions. As developing new products are costly and need a substantial investment of time and resources, focal firms can support the required investment (for example in critical technologies (Melander, Rosell and Lakemond 2014)) with the help of their powerful suppliers, which result in a durable presence in the market. In addition, working closely with suppliers can assist focal firms to prevent the excessive levels of product capibility which have been provided by suppliers (Lukas, Whitwell and Heide 2013). This form of relationship can influence the effectiveness of NPD projects leading to the greater return on investment over the long term (Tracey, Heide and Bell 2014).

Secondly, it may be prudent for the focal firms to identify "lower-tier" actors because moving towards sustainable development objectives increasingly shifts to managing sustainability issues beyond the focal firms (Meinlschmidt, Schleper and Foerstl 2018). Some SCN actor's non-compliance with sustainability standards however, may create a negative public image for customers who can hold the focal firms accountable for such a misbehaviour. Of interest is that frequently, these non-sustainable actions are conducted at the sub-actor level (Wilhelm et al. 2016b). At first glance, these actors may seem peripheral in the SCN, but by examining them deeply via the four identified factors related to the SCN structure, some of these actors may become a key player. For example, some suppliers may have numerous links (information flow and material flow) with key actors (such as competitors, NGOs) in the SCN. These suppliers may be quite remote from focal firms or may not very dependent on them, however, they may be powerful actors. Two examples of this are where supplier have a relationship with competitors or may be too transparent due to having a relationship with prominent NGOs in the SCN. These supplier characteristics (being powerful and transparent) can be a potential opportunity for focal firms to employ a specific RMS to exert some control over them in managing sustainability issues. By identifying these actors, marketing managers can identify new developments in the industry in terms of

sustainability issues undertaken by other focal firms (competitors) in the SCN whilst protecting their firms from negative publicity created by inappropriate behaviours. In other words, some actors neglected by focal firms may emerge as becoming important since they are critical for other key actors in the SCN. These actors could be the main target for the focal firm to establish a quality relationship that enables the management of sustainability issues. In this way, they can create a balance between the cost their firms incurred (for example environmental cost (Kotler 2011)) and their growth goals to follow sustainability.

Thirdly, the relationship management literature has largely concentrated on long-term relationships, highlighting the necessary requirements on how to achieve a long-term exchange (Mysen, Svensson and Högevold 2012). In addition, the governance design principles and value analysis can affect price determination process (John 2017) and types of contracts used between two firms (Ghosh and John 2005). However, in the sustainability context, the focal firm may not apply sustainability practices to each individual actor by having a close relationship within the SCN because of the costs associated with the practices and it being nearly impossible to manage thousands of low-tier actors in relation to sustainability issues (Rauer and Kaufmann 2015; Meinlschmidt, Schleper and Foerstl 2018). The high upfront cost of sustainability practices can also be considered an important barrier to implementing SSCM (Walker, Sisto and McBain, 2008). Using the conceptual framework in this paper can encourage further discussion and assist managers in reducing the cost barrier by allocating the right practices for the right actors through adoption of an effective RMS. Each RMS can have a stake of claiming expected share of value generated by involved SCN actors, which can be managed by assigning specific investment in the effective RMS (Ghosh and John 2005). By analysing each actors' position in relation to each of the four identified factors within the SCN structure, focal firms can implement such practices in a cost-effective manner. For example, the focal firm may focus on reinforcing a relationship with the legitimate actors such as an NGO (e.g. Greenpeace) through collaborative projects, thus offering natural solutions which may have considerable costs. These type of marketing costs can be justified as being connected

with legitimate actors can provide more sustainable legitimacy for focal firms (Crespin-Mazet & Dontenwill 2012). This is also helpful for multinational companies, which are dealing with the increased complexity of allocating adequate investment to manage their global sourcing and marketing activities (Pagano 2008). For multinational companies, appropriate assigning of marketing resources to foreign partners and stakeholders can be a vital component in their strong presence in the market (Grewal et al. 2018) as it can provide better information and knowledge creation process Watson et al. 2018). In this way, the focal firms can leverage stakeholder pressures in terms of sustainable supply chain activities effectively.

Fourthly, focal firms can change the structure of the SCN in favour of applying a specific RMS to a SCN actor. The different structure may require different strategies by focal firms to cope with sustainability issues in the SCN (Tachizawa and Wong 2014). Building a close relationship however, is not always the best RMS as, for example, some focal firms may not need or want to establish a close relationship with all of their suppliers (Daugherty 2011). This paper's conceptual framework provides four RMS, which focal firms can apply according to their SCN structure. The transition between different RMS can be possible as the focal firms have the ability to remodel the SCN structure or the pattern of interactions with their SCN actors. For example, by identifying more alternative suppliers (that have reputations in the following sustainability standards) for bottleneck products (Kraljic 1983), the focal firms can have more leeway to choose a different RMS. By doing this, the focal firms can change the dependency factor in the SCN structure. This means adding new (legitimate) suppliers to the supply base decreases the focal firm's dependency on the previous suppliers which results in reducing the complexity of the supply. In this new situation, the focal firm may use a different RMS that needs less time and effort than a traditional one to follow sustainability issues with the previous suppliers (which may have no intention of adopting sustainability standards) and instead building a closer relationship with the new (legitimate) suppliers. Thus, the focal firms can employ their desired RMS based on changing the pattern of interactions in the SCN structure via focusing on the four identified factors.

Fifthly, similar to the focal firms, SCN actors can also analyse their overall network position in the SCN and shape it based on their strategic actions. The different types of relationships that a SCN actor maintains with other SCN actors (particularly with focal firms) will, in turn, influence the degree of involvement and how they interact and negotiate over time (Håkansson & Ford 2002). This may also affect the SCN actors' interfirm partnerships over time (Cui, Calantone and Griffith 2011). However, an existing SCN structure can be considered as the main constraint for SCN actors in aligning with their focal firms' intentions towards more collaboration (Gualandris and Pagell 2015). In this way, the SCN actors can overcome this constraint by analysing the shape of SCN structure with four identified factors. For example, they can change the configuration of the interactions to receive more attention from their focal firms, promoting products' speed to market (Tracey, Heide and Bell 2014). Marketing managers can work on the SCN structure by decreasing the distance with their key customers (focal firms) to facilitate the information exchange that can result in better communication. Through implementing business to business infrastructure such as electronic data interchange (EDI), they can provide a better base for establishing a close relationship with their key customers. As a result, the SCN actors can benefit from the extensive knowledge, joint learning and the provision of technical assistance by the focal firms regarding the sustainability issues and improve themselves in this area, which may result in a new source of income from a sustainability context. In doing so, the conceptual framework within this paper, provides managers with guidelines to help them make informed strategic decisions regarding the effective diffusion of sustainability practices throughout their SCN and enable improved understanding and management of the nuances in adopting RMS.

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